# Efficient Data Transmission in Vehicular Delay Tolerant Network

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***Abstract-*** *Malicious and selfish behaviors represent a serious threat against routing in delay/disruption tolerant networks. Due to the unique network characteristics, designing a misbehavior detection scheme in vehicle network is regarded as a great challenge. The sending information from source to destination, the message stored in a node in spite of destination user in a non- coverage area. In this project, we propose a new architecture of DaVe for secure efficient trust establishment to the base station. Delay-tolerant data traffic is offloaded from the data networks to the connected vehicle networks without extra infrastructure/hardware deployment. The main objective of this project is to introduce a secure communication system that employs cryptography to encrypt and embed the secret message to be transmitted over a non-secure channel. Here we are using color sensor, it sense the coverage area of the sender and receiver. First the data can be separated into packets. The packets can transfer into sender and receiver. If any source or destination node is in out of coverage, that time data transmission is stop. After when they will enter in coverage area, then balance packets will receive. To further improve the efficiency of the proposed scheme, to reduce computational complexity.*

***Keywords-*** data tolerant network, partially markov decision process

## I. INTRODUCTION

### 1.1 OVERVIEW

In recent years, vehicular technologies have been experiencing fast development, thanks to the increasing demands on automatic driving, traffic and weather information dissemination, infotainment data acquisition, and most importantly, safety issues. Vehicular networks, which have been proposed for real-time, reliable and secure information delivery among the vehicles and from/to the Internet, draw a lot of attention from both academia and industries. Connecting the vehicles to the Internet usually requires the access service provided by the base stations (BSs) and/or the roadside units (RSUs). However, BSs are built for cellular networks without specific design for vehicular communications, and RSUs are usually sparsely deployed because of the high capital expenditure (CAPEX) and operating expense (OPEX). Mobile Internet access is getting increasingly popular today and provides various services and applications including video, audio and images. In addition, the total mobile data traffic throughout the world will reach about 3.6 extrabytes per month, and the compound annual increasing rate is about 108%. Therefore, it is very important to find new ways to manage such increasing mobile data traffic. To cope with this explosive traffic demands, growth and limited network capacity, it is an urgent and important agenda for cellular providers to provide quick and promising solutions. This project focuses on the offloading problem of cellular network through the short range communication technologies. We propose the new architecture DaVe, a QoS-aware traffic offloading scheme is proposed to allow the delivery of delay-tolerant data over the connected vehicle networks, no matter whether the data are from the connected vehicle networks. Thus, more resources from other data networks with continuous connectivity and better QoS performance could be utilized for delay-sensitive traffic. This is a low- cost solution to handle the data traffic explosion because no deployment of extra infrastructure or hardware is required. The objective of this project is to form a secure communication and we will provide high authentication levels. The decision optimization problem is formulated as a partially observable Markov decision process (POMDP) to tackle the problem of instable wireless connections. Based on the moving information of the vehicles, RSUs, and their neighbors, optimal decisions are made with the objective of maximizing the discounted total reward function. Furthermore, we propose a heuristic algorithm to reduce the computational complexity.

## II. VEHICULAR NETWORKS

Wireless communication system composed of vehicles equipped with radio interfaces, and capable of exchanging data among them as well as with the cellular network or other fixed infrastructures. Vehicular networks are a particular type of network data transmission which vehicles act as communication infrastructure providing short-range Wi-Fi communication with each other or with the roadside infrastructure. There are three main network architectures for vehicular networks: pure vehicle-to-vehicle Ad hoc (V2V) that performs spontaneous wireless communication without an infrastructure or pre-configuration, Infrastructure-based (V2I –

Vehicle to Infrastructure) that provides a wired backbone for the network, once fixed nodes distributed along the roads act as access point to 802.11 infrastructure networks, and hybrid which combines the solution ad hoc with the infrastructure model. Each of these architectures has their peculiarities. The ad hoc architecture has the advantage of the fact that vehicles acting as routers can forward traffic over multi-hops in a decentralized manner, however the infrastructure architecture can be used to increase connectivity in high mobility situations and allow access to Internet.

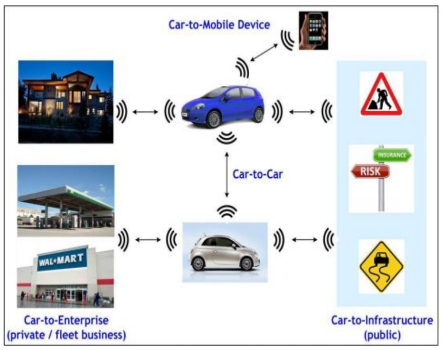


Fig. 1 Communication channels for Car-to-X communication.

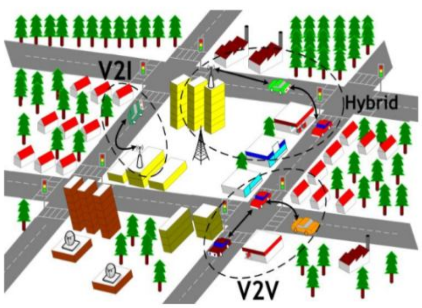


Fig. 2 Illustration of a vehicular network scenario.

Another aspect that should be highlighted in the development of vehicular networks refers to the fact that these specific networks have influenced large government investments in the last years. Today, in many countries there is a wide appeal for environment sustainability through cooperative Intelligent Transport Systems (ITS), economic development, and social inclusion. It is clear that the investments in vehicular communications is advantageous in the sense that the return in terms of keep mobility, reduce road fatalities, and further improve the ecology and efficiency of road traffic is large. Investments in active safety, to prevent accidents, are a trend of the 21st century. The social context is other notable aspect, since this technology may provide low-cost communication for remote, rural or poor regions that do not have the necessary network infrastructure. Vehicular networking also has been attracting considerable attention from the car manufacturers and automotive OEMs (original equipment manufacturers). There is a growing effort in the development of several technological solutions that enhances travelers and passenger’s experience. The cars are not recognized just as a mean of transport, but as an entertainment solution.

Among some main vehicular networks applications stands safety networks which are responsible for disseminate advertisements and information about road safety, speed limit, traffic jams and climate conditions, social networks, and interactive networks that can offer up video streaming. The vehicular networks have considerable challenges for large-scale application.

Due the features such as high vehicle mobility, dynamic scenarios, sparsity of vehicles, short and limited contact durations, scalability in terms of number of nodes, disruption and intermittent connectivity, and strict requirements for latency, traditional routing schemes proposed for other wireless networks as mobile ad hoc (MANETs) and applied to vehicle ad hoc networks (VANETs) are not suitable. The different protocols do not present satisfactory performance because do not assume an sporadic connection since often no end-to-end path exists between a source and its destination, and do not tolerate excessive packet drops. Thus, V2V and V2I applications are not appropriated for these challenging environments.

For this reason, adaptations or new protocols are required in order to permit carry data from source to destination even in situations of network partitioning or end-to-end connectivity inexistent.

**Delay-Tolerant Networks**

The TCP/IP based model is inefficient when faced with critical situations of connectivity that causes a frequent absence of an end-to-end path between nodes. Dynamic network scenarios, long latency, high packet loss, heterogeneous transmission rates, and high bit error rates are factors that hamper the conventional routing protocols work well since they are not designed to accommodate situations of disconnection. It is not possible to determine the path or route for datagrams from source to destination without information about topology and the link costs. Due these problems, various research efforts were made to develop an appropriated network solution. The best results apply to Delay Tolerant Networks (DTNs). It promises to manage communication in challenged environments. Some of these environments include: wireless communications, communications between mobile devices with power constraints, underwater communications, battlefield communications, and interplanetary communications among others. DTNs overcome the problems cited by using the store-and-forward method . This method allows that in-transit messages (called bundles) can be delivered to the destination since each intermediary node stores than persistently and forward to the next hop. It is similar how the postal service delivers packages. Figure illustrates the store-carry-and-forward paradigm.

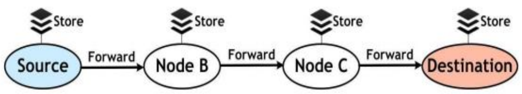


Fig. 3 Illustration of the Store-carry-and-forward paradigm.

**DTN architecture**

The DTN architecture implements the store-and-forward method by overlaying a new protocol layer called bundle layer over the transport layer. This DTN over TCP approach allows applications to communicate with each other across heterogeneous networks providing an end-to-end data transfer. The application data units (ADUs) sent by DTN applications are transformed by the bundle layer into one or more protocol data units called bundles, which are stored-carried-and-forward by DTN nodes. The bundle term was chosen to make evidence that there is no interactivity in intermittent scenarios. Thus, all the necessary information required for a transaction is “aggregated” and sent only once to minimize the number of round-trip exchanges (e.g. optional acknowledgments, connection setup etc.). The bundle layer protocol is implemented in all DTN nodes and executes special features like dynamic routing, naming, contact scheduling, and optional reliability through the custody transfer service and transmission status reports.

**DTN routing strategies**

The DTN routing strategies can be divided into deterministic and stochastic cases according to the knowledge available about the network topology. Once the DTN network topology is dynamic, the contact opportunities or time which links are active, may exist for only a short period during hours, days or even weeks. Thus, information about the network operation or even assumptions are useful to support multi-hop data transmission. A scenario is called deterministic when the network behavior is known in advance. In this situation, connections, node information like buffer space, energy and transmission capacity, network topology, and future movements are fully known to the network nodes, allowing schedule transmissions. The accurate estimates of contact time intervals are very useful because it allows nodes to make pre-established agreements.Unlike the deterministic scenario, in a stochastic scenario (or dynamic) the network behavior is not completely known. The opportunistic contacts are performed randomly at an unscheduled time. The network nodes (e.g. people, vehicles, aircraft, etc.), although are autonomous (independent mobility pattern), may communicate with any neighbor node (direct contact or within line-of-sight of nodes) in order to create communication opportunities with other nodes that are out of range. There is no guarantee that messages can reach the destination, since it is unable to calculate routes, however, is possible with some protocols increase the delivery probability.

**Vehicular Delay-Tolerant Networks**

Vehicular Delay-Tolerant Network (VDTN) is a new DTN concept where vehicles act as the communication infrastructure, furnishing low-cost asynchronous opportunistic communications, variable delays, and bandwidth limitations defining a non-TCP/IP end-to-end network. VDTN emerges as an alternative solution to outline connectivity limitations once that it utilizes the store-carry-and-forward method to allow that in transit messages (called bundles) can be delivered to the destination by hopping over the mobile vehicles, even that an end-to-end path does not exist. Since messages are stored persistently in a buffer and forward to the next hop, a new communication infrastructure is created allowing asynchronous communication under the most critical situations like variable delays and bandwidth constraints.

The basic entities of a VDTN, that manage the communication are terminal, mobile, and relay nodes. Terminal nodes, generally located in remote areas, are fixed devices that act as access points (APs) or servers providing to end-users real and non-real time information and services, like electronic mail (eMail), distance learning, and telemedicine. Once having direct access to the Internet, it can provide updated information about roads, weather conditions, among others. Mobile nodes (e.g. bus, cars, trains, bikes etc.), act as mobile routers and are responsible to store-carry and-forward physically bundles between the other networks entities. A mobile node can also generate information and analyze diagnose messages generated by sensors, although the terminal nodes is the main responsible to act as traffic sources and traffic sinks. Relay nodes are stationary nodes used to increase the bundle delivery ratio performance and the number of opportunistic contacts. Located in strategic positions (e.g. crossroads) with capability to download, store and upload data from/to mobile nodes, it can increase the probability that the bundles reach the destination.

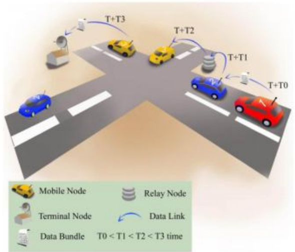


Fig.6 Illustration of the store-and-forward concept through VDTN networks.

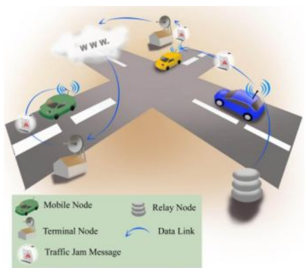


Fig.7 Illustration of updated traffic jams information transmission.

Figure illustrate the store-and-forward concept and interactions between VDTN node types in a real scenario where a traffic jam message is disseminated. The network nodes store bundles persistently in a buffer or secondary memory and forward them for each other to the final destination. In order to support communication, VDTN introduces a layered architecture, acting as an overlay network over the link layer, aggregating incoming IP packets in data bundles (large IP packets), using out-of-band signaling, based on the separation of the control plane and planes. The new layer named Bundle Layer is responsible to outline the problems associated with intermittent connectivity since it executes a store-carry and-forward routing allowing that data or bundles are stored in mobile nodes until the final destination is found.

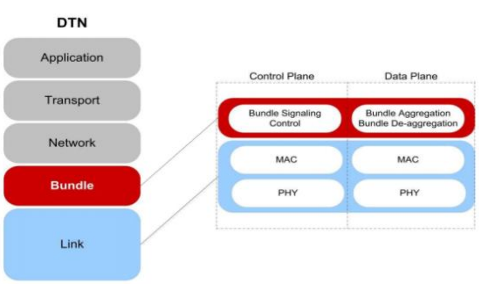


Fig.8 VDTN layered architecture

**Concept**

Vehicular networks have been widely measured as a promising architecture to enable vehicles-to-vehicle (V2V) and vehicle-to infrastructure (V2I) connections, and the wireless access to the Internet for the vehicles. Current sparse deployment of the roadside units (RSUs) requires multi-hop data transmission among the vehicles and the RSUs has been introduced. Vehicle-to vehicle (V2V) and vehicle-to-infrastructure (V2I) communications, enabled by IEEE 802.11p and dedicated short-range communication (DSRC) technologies, allow road safety, driver assistance. Connected vehicle networks focuses on sending the data generated from or required by the vehicle networks themselves, of which the data traffic is light; thus, the vehicle-network resource utilization efficiency is low. On the other hand, a large amount of delay-tolerant traffic in other data networks consumes significant communication resources. In this project, we introduce a new architecture of DaVe to utilize efficiently the potential resource from connected vehicles and to mitigate the congestion problem in other data networks.

**Methodology**

With the DaVe architecture, a QoS-aware traffic offloading system is proposed to allow the delivery of delay tolerant data over the connected vehicle networks, no matter whether the data are from/to the connected vehicle networks. Thus, more resources from other data networks with continuous connectivity and better QoS performance could be utilized for delay-sensitive traffic.

Nowadays, internet multimedia is very popular; a significant amount of data is exchanged every second over a non-secured channel, which may not be safe. Therefore, it is essential to protect the data from attackers. To protect the data cryptography technique can be used. Cryptography is the learning of keeping the transmitted data secure. It provides data encryption for secure communication. The encryption process is applied before transmission, and the decryption process is applied after receiving the encrypted data. We propose a genetic algorithm to reduce the computational complexity.

## III. SYSTEMMODEL

**PROPOSED SYSTEM**

The information security has become one of the most significant problems in data communication. A communication system is reliable as long as it provides high level of security. Usually, users exchange personal sensitive information or important documents. In this case; security, reliability, authenticity and privacy of the exchanged data should be provided over the transmission medium. Internet multimedia is very popular; a significant amount of data is exchanged every second over a non-secured channel, which may not be safe. Therefore, it is essential to protect the data from attackers. To protect the data cryptography technique can be used. Cryptography is the learning of keeping the transmitted data secure. It provides data encryption for secure communication.

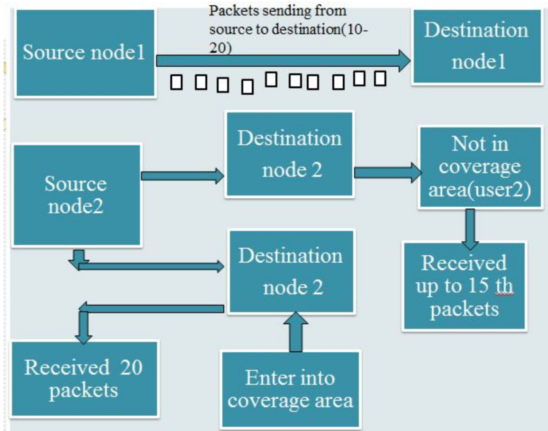


Figure 9

## ALGORITHM

Heuristic algorithm is proposed to reduce the computational complexity. The performance of our proposed optimal scheme is compared with three other schemes, including “data network only” (only data network is utilized to deliver the data), “connected vehicle network only” (only connected vehicle network is utilized, with optimal DB scheduling), and “random walk” (only connected vehicle network is utilized, with random DB scheduling).

**ADVANTAGE:**

- ✓ It can provide some quick and relatively inexpensive feedback to designers.
- ✓ You can also obtain feedback early in the design process
- ✓ Assigning the correct heuristic can help suggest the best corrective measure to designers
- ✓ You can use it together with other usability testing methodologies
- ✓ You can conduct usability testing to further examine potential issues.

## IV. SIMULATION RESULT

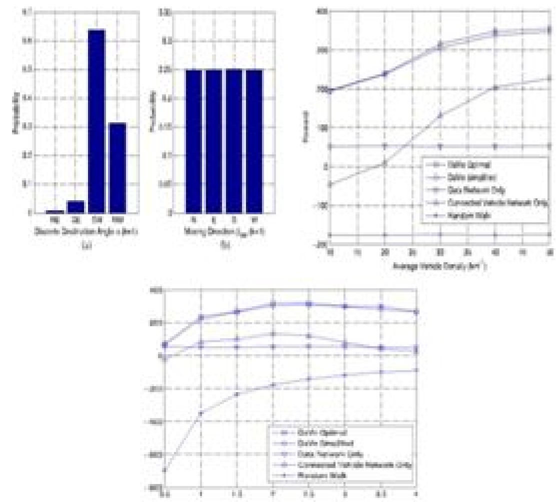

Figure 10

## V. CONCLUSION

The proposed architecture DaVe, a QoS-aware traffic offloading system is proposed to allowed the delivery of delay-tolerant data over the connected vehicle networks, no matter whether the data are from the connected vehicle networks. Thus, more resources from other data networks with continuous connectivity and better QoS performance was utilized for delay-sensitive traffic. This is a low-cost solution to handle the data traffic explosion because no deployment of extra infrastructure or hardware is required. A distributed data hopping mechanism is proposed to simplified delay-tolerant data routing over the connected vehicle networks. Communication resources in vehicle networks are efficiently utilized without affecting other data traffic, such as road safety and driver assistance. Also, the next-hop decisions are optimally made in a distributed manner. Neither centralized control point nor global network topology information is required in the scheme. The decision optimization problem is formulated as a partially observable Markov decision process (POMDP) to attacked the problem of instable wireless connections. Based on the moving information of the vehicles, RSUs, and their neighbors, optimal decisions are made with the objective of maximizing the discounted total reward function. The proposed heuristic algorithm is reduced the computational complexity. Moreover genetic crypto algorithm is used to encrypt the data for secure communication

## VI. FUTURE WORK

We have designed a system based on vehicular networks by using NS2 simulation software to send data from vehicular unit 1 to vehicular unit 2. Here intruder cannot access the data because the data is encrypted form. If suppose intruder access data then he cannot get the original data, only get the encrypted data. As future work, we will show in terms of network traffic, delivery delay, and relevance of information with genetic crypto algorithm with accurate vehicular traces.

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