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Employing a UAV Unit for the Data Dissemination Protocol in Vanet

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Abstract:- Vehicular Ad hoc Network (VANET) has newly become one of the extremely active research areas for wireless networking. Then VANET is a multi-hop wireless network with very high mobility and intermittent connection generation, it is important to efficiently handle the data dissemination issue in this rapidly altering environment. The researchers in remaining proposes a Real-Time Traffic-Aware Data Gathering Protocol (TDG) where the dynamic segmentation switching is assumed to handle the communication limitations. TDG is lightweight and dynamically designed for collecting and forwarding datapackets created on current and rapid evolving traffic conditions. However, the remaining implementation may not fit into such a highly dynamic environment since the nodes in the network must often achieve rerouting due to their discrepancy of connectivity. In this project, by employing UAVs as flying relays with data caching capability in VANETs, we design an improved UAV-aided data disseminationprotocol. In addition, the drivers in the vehicles may want to acquire some data, but they do not know the address/location of such data storage. Hence, the named data networking (NDN) approach might be more desirable here. The NDN architecture is proposed for the future Internet, which emphases on the delivering mechanism based on the message contents in its place of relying on the host addresses of the data. In this project, a new protocol named Roadside Unit Assisted of Named Data Network or RA-NDN is presented. The Roadside Unit (RSU) can operate as a standalone node (SA-RSU). One benefit of organizing SA- RSUs is the enhanced network connectivity

Keywords:- *VANET, TDG, NDN, RSU, ITS.*

I. INTRODUCTION

Supported by both vehicle-to-vehicle(V2V) and vehicle-to-infrastructure (V2I) communications, vehicular ad-hoc networks (VANETs) can significantly enhance the quality of experience for the drivers and passengers by enabling a various road safety and traffic efficiency applications, e.g., safety warning and intelligent navigation. A particularly promising application is cooperative data dissemination associated with safety and commercial services to the vehicles.

Typically, the framework of accommodating data dissemination can be confidential into distributed protocols and centralized ones. Distributed protocols are generally built upon some random-channel-access techniques without a central node (i.e., the control server) to collect the global channel state information (CSI) of the vehicles inside its area of interest (AoI), which encounter issues such as the random interaction for transmission requests or decoding status exchange among vehicles, as well as the inevitable collision problem.

Besides, with limited knowledge of the entire network, the nodes transmit data according to some established rules (e.g., with the CodeOn, the node with maximum knowledge of packets has the highest priority to transmit data). Hence, the distributed protocols can only achieve local optimum, which restricts their network performance. On contrary, centralized data dissemination protocols use a control server (CS) to synthesize the information reported by RSUs and vehicles and then schedule the data transmissions, which leads to an improved throughput and reduced collision probability in comparison with distributed ones. However, the acquired CSI at the CS is always imperfect in traditional centralized protocols, since the coherence time of small-scale fading is much smaller than the delay of the CSI collection.

Based on the moving patterns of the vehicles in VANETs, previous work applies large-scale fading prediction in VANETs, which improves the accuracy of the CSI and thus improves the delay and throughput performance. Most recently, unmanned aerial vehicles (UAVs) have been widely applied in wireless communication networks to enlarge the effective communication coverage and improve the network performance.

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In VANETs, V2I and V2V links always suffer from severe shadowing and path loss effects of obstacles, which degrades the channel quality and thus decelerate the process of datadissemination. Due to the high possibility of line- of-sight (LoS) air-to-ground (A2G) communication links between UAVs and ground users, UAVs have the promising potential to improve the efficiency of data dissemination in VANETs, behaving as flying relays or small base stations (BSs).

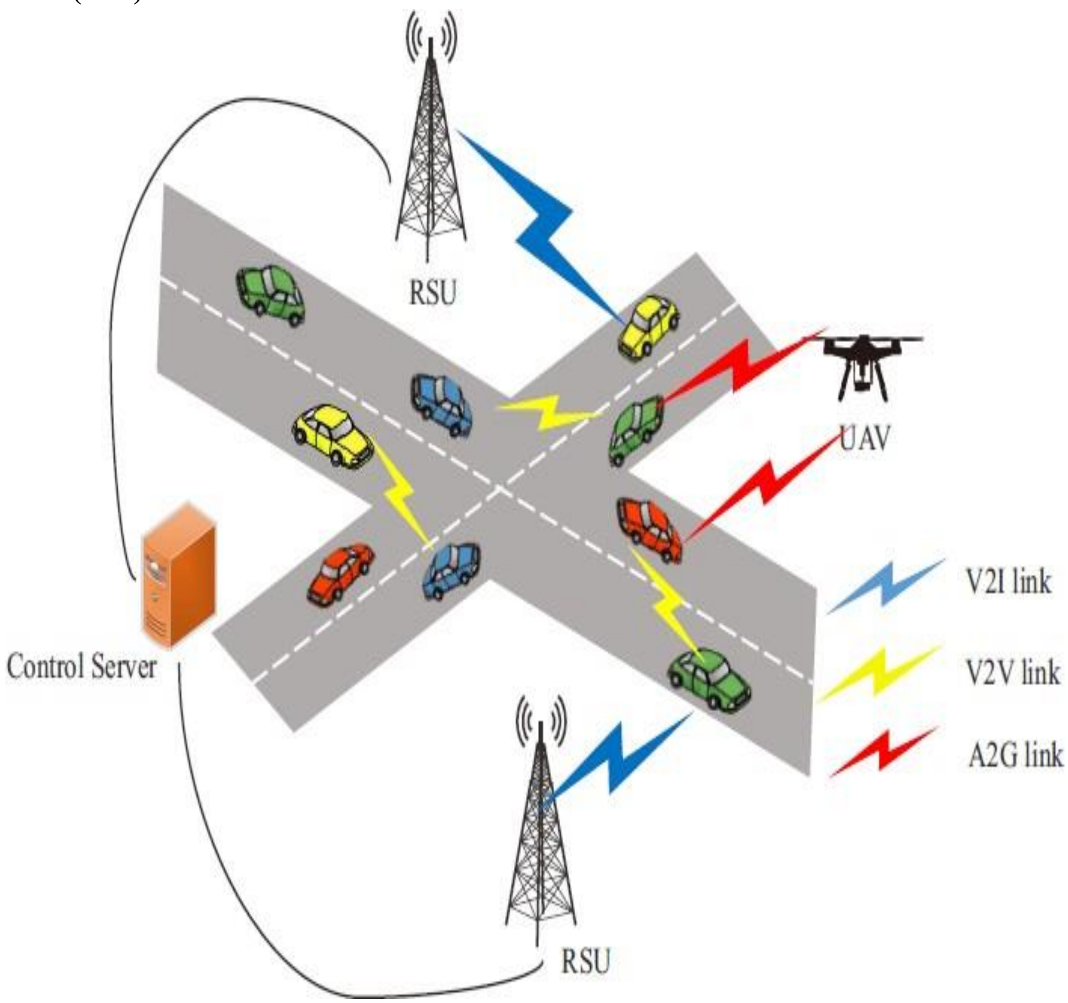

Fig. 1. UAV-aided cooperative data dissemination in VANETs

II. LITERATURE STUDY

System analysis will be performed to determine if it is flexible to design information based on policies and plans of organization and on user requirements and to eliminate the weakness of present system. This chapter discusses the existing system, proposed system and highlights of the system requirements.

Therefore, in the existing, the researchers presents the traffic data gathering (TDG) protocol, a lightweight real-time data collection protocol that works effectively in high traffic mobility, rapidly changing trends with reduced data communication overhead with better efficiency and effectiveness for large-scale data. TDG also offers data transmission by the sender and data extraction at receiving side.

The main contributions of this work are enumerated as follows:

- They proposed a dynamically designed solution for collecting and forwarding data packets based on current and rapidly evolving traffic conditions to reduce data communication overhead while incorporating real-time large- scale data collection.
- Dynamic Segmentation Switching (DSS) scheme is proposed to reduce communicationcost.
- Next, a real-time solution is proposed forCluster Head (CH) election in a linear time complexity

- **Drawbacks**
  - ➢ While, the vehicles transmit their real time information and Internet requests to the infrastructure drones, the drones represent gateways to the Internet and the infrastructure of other systems such as the intelligent transport system (ITS).
  - ➢ However, it is difficult, in terms of infrastructure cost (number of drones), to get VANETs with full connectivity by covering all gaps in the highway.
  - ➢ On the contrary, using a small number of drones causes long vehicle-to-drone delays due to having to carry packets for a longer distance, especially in VANETs with low vehicular density.This is because the vehicles use the carry-and forward strategy through these gaps until reachingthe next drone.

III. DEVELOPMENT OF EMPLOYING A UAV UNIT FOR THE DATA DISSEMINATION PROTOCOL IN VANET

This work is an extension, which is a modification of the data dissemination protocol byusing Named Data architecture. The contributions of the work are as follows. We propose a new datadissemination protocol to assist the request packetto steer toward the direction of content producer. Then, this protocol modifies the format of the request packet and data packet, which contain geo-location information, and applies a timer- based forwarding decision mechanism to prevent the broadcast storm.

The recent Named Data Networking (NDN) project is an enhanced version of the Networking Named Content or Content Centric Network (CCN) architecture. The NDN suggests an development from the IP architecture (i.e., host-centric network architecture) to named data networking (i.e., data-centric network architecture). NDN maintains two packet types: “Interest” packet (question) and “Data” packet (answer) in Fig. 2.

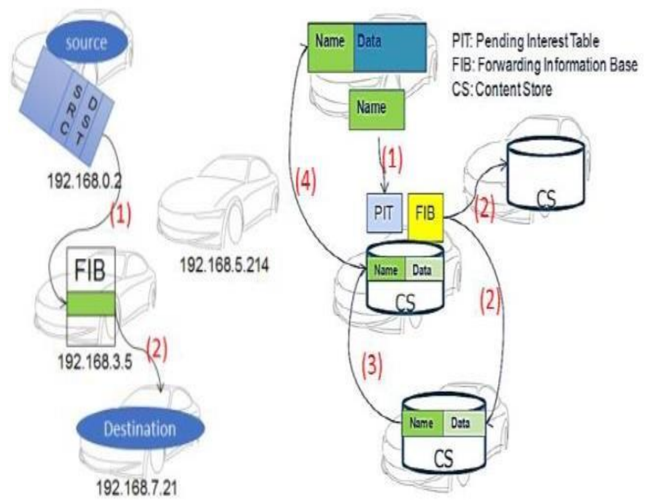

Fig. 2: NDN Architecture

A requester broadcasts an Interest packetto other nodes in its transmission range. TheInterest packet can be forwarded through thenetwork until the original content provider or any node, which stores a cached content, replies with the Data packet.When a packet arrives, a node checks the IP header in the Forwarding Information Base (FIB), which maintains the IP destination, and subsequently forwards the packet to the designated destination node. Each NDN node has three important data components:

- Pending Interest Table (PIT) keeps track of the names and incoming received Interest packets.
- Forwarding Information Base (FIB) is a routing table, which maps the name components to interfaces, to relay Interests

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towards the content source (it differs from FIB in the existing network instead of IP).
- Content Store (CS) caches the Data packet.

The NDN node follows the algorithm:
- If it has an Interest packet that matches in NONCE list (which uniquely identifies each interest), it is dropped. Otherwise, it is checked in the Pending list in the PIT table.
- If the Interest packet is in the PIT, it is discarded.
- Otherwise, it searches in the CS table for a matching Interest. If it does not match with the Interest, it also checks in the FIB table for the forwarded Interest packet on the outgoing interface (for example, wireless channel), and the Interest is added in the PIT.
- If it has a Data packet that matches with the Interest in the CS, it replies with the Data packet on the same path as the Interest arrived.
- Before forwarding the Data packet, it is stored in the CS. Next, the Data packet is checked in the PIT to satisfy a pending request, and it is forwarded back to the original requester.
- **Benefits:**
  - The closed-form expression of vehicle-to- drone packet delivery delay probability distribution suggestions a design tool that can control the maximum separation distance between two adjacent drones though satisfying a probabilistic requirement of vehicle-to-drone packet deliverydelay.
  - Consequently, we can compute the minimum number of drones required to cover a two-way highway road.
  - Instead of being overwhelmed by data flooding all over the VANET system, the RA- NDN protocol lets only necessary data be sent andbroadcasted in the system.
  - Moreover, it can be used for the optimization of drone assignment.

A. Module Design

The proposed process of a modified NDN protocol in VANET, which deploys SA-RSU and will be referred to as the RA-NDN protocol, is described. Each SA-RSU announces the name prefixes of the "Interest" message to report the traffic information. The proposed data dissemination protocol operation is separated into two modes: broadcast and active modes.

B. Broadcast Mode

The protocol begins collecting data when each SA-RSU periodically broadcasts apolling message. We assume that the data collection knows the structure of the name prefixes, which is the /polling prefix. Consider cell C1, every node runs the following algorithmand adds the RSU ID header to check for vehicles in the cell of SA-RSU. The requester node (or SA-RSU) sends the polling message to vehicles in its cell. Every vehicle who has received the polling message in the identicaltransmission range of SA-RSU will set the timerbased on the distance away from SA-RSU, and the farthest vehicle will forward the polling message to the next hop of SA-RSU.

For example, suppose that vehicles V1,2 and V1,3 are in the border of the transmission range of roadside unit R1. Let R1 send a pollingmessages to every vehicle in its transmission range. V1,2 and V1,3 are the forwarder nodes, who will onward the received polling message to the other vehicles in the next hop. Then, V1,1 and V1,4 become the next forwarder nodes. Concurrently, V1,2 and V1,3 will wait for data d1,1 and d1,4 from vehicles V1,1 and V1,4,respectively. Until V1,1 and V1,4 cannot forward the polling mails to any vehicles, they will direct d1,1 and d1,4 to the V1,2 and V1,3. When V1,1 and V1,4 send d1,1 and d1,4 to V1,2 and V1,3, V1,2 and V1,3 will comprise their data with the conventional data as d1,1 + d1,2 and d1,4 + d1,3, correspondingly, before sending them back to R1.

C. Active Mode

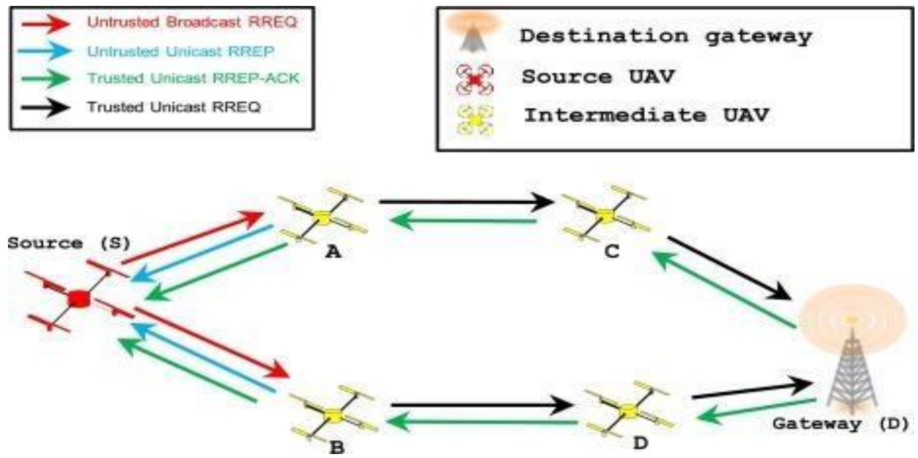
When a vehicle needs information from the SA-RSU, it sends an appeal info. message, which can be recognized by the /traffic/RSU ID prefix to a SA-RSU. In return, the SA-RSU will send a reply info. message to that requesting vehicle when the vehicle along the path does not store the reply info. message. The choice process performed in each vehicle.

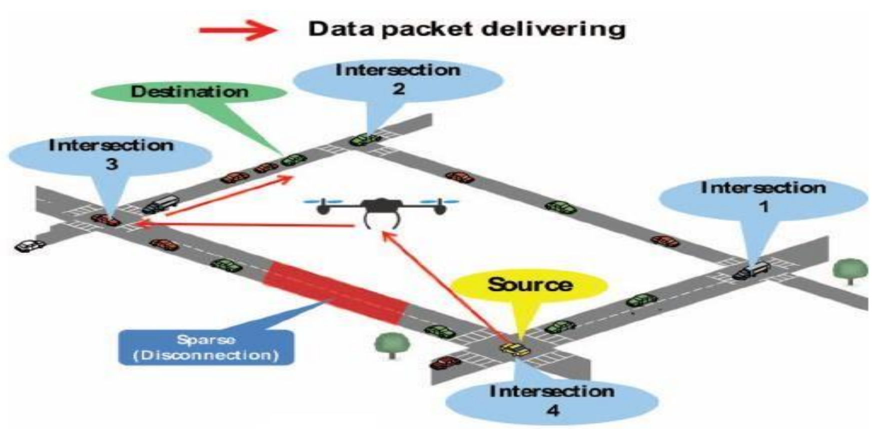
When the requester node sends the requestinfo. message, the vehicles run the algorithm and add the checking distance. Every vehicle that receives the request info. message will set the timer relative to the distance away from the last hop vehicle. Among these vehicles, the farthest vehicle will forward the request info. message until the SA-RSU or any node that maintains a cached copy reply with the reply info message.

D. Forwarding Decision

Each vehicle performs the distance metric calculation for the polling message or request info. Message. To make furthering decisions, a timer-based mechanism comparable to is applied. The forwarder broadcasts the polling message or request info. message with its position to all vehicles in the transmission range. Then, the receivers calculate the distance between its position and the position of the forwarder. Then, the expiry time for all vehicles is calculated. Therefore, the vehicle that is farther from the forwarder than other vehicles will wait with a shorter period than a nearby forwarder.

IV. ARCHITECTURAL DIAGRAM





Path Selection

V. RESULT AND DISCUSSION

The implementation phase focuses how the engineer attempts to develop the system. It also deals with how data are to be structured, how technical details are to be applied, how interfaces are branded, how the design will be interpreted into programming and hoe the testing will be performed. The methods practical during the growth phase will vary but three specific practical tasks should continuously occur.

- The software design
- Code generation
- Software testing

The scheme group has changed with accountability to develop a new system to meet supplies and design and development of new material system. The source of these study facts is diversity of users at all level through the organization.

VI. CONCLUSION AND FUTUREENHANCEMENT

In this project, the proposed protocol is called the Roadside Unit Assisted of Named Data Network or RA-NDN. Respectively SA-RSU can individually operate deprived of relying on a connection between them or a connection between the RSU and the data center. Deploying the SA-RSU can recover the network connectivity and data dissemination in mobile environments. This work proposed a closed-form appearance for the probability delivery of the vehicle-to-drone packet delivery delay on a two-way thoroughfare. In addition, based on that closed-form appearance, we calculated the minimum drone thickness (maximum separation distance between two adjacent drones) that stochastically limits the worst situation of the vehicle to drone packet delivery delay.

Furthermore, that is added to the location service in a VANET to animatedly and occasionally obtain the required number of active drones founded on the current highway connectivity state by obtaining the maximum distance between each two adjacent drones while satisfying a probabilistic restraint for vehicle-to-drone packet delivery delay. The

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simulation results display the accuracy of our analysis and reflect the relative between the drone density, vehicular density and speed, other VANET limits, and the vehicle-to-drone packet delivery delay.

In addition, we will express the problematic as an optimization problem to attain the minimum end-to-end delay for V2V communication with a least number of drones. Moreover, we will express an optimization problem to obtain the optimal placement for the drones in VANETs by means of DAS. To efficiently mix drones into vehicular networks, more research concentrating on practical solutions in DAVN should be conducted in the future.

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