

## CS540 - Paper Review Report # 17

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Hailu Belay Kahsay - 20155624

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### **Title: A comprehensive Survey on Vehicular Ad-Hoc Network**

**Author:** Saif Al-Sultan n, Moath M. Al-Doori, Ali H.Al-Bayatti, Hussien Zedan

Vehicular ad-hoc networks(VANETs) is an application of mobile ad-hoc network(MANET) where the mobile nodes are vehicles (i.e., car, trucks, etc.) travelling across a road or a street. The main characteristics of these networks are the high mobility speed of the nodes and their position constrained to the layout of the roads or streets that has the potential in improving road safety and in providing travellers comfort. It enables communications between nearby vehicles (V2V communications) and road-side infrastructure, called road side unit (V2I communications).

The survey paper talks about VANET issues such as: VANET architecture components(AU, OBU and RSU), VANET communication domains(In-vehicle domain, Ad hoc domain and Infrastructural domain), wireless access technologies( such as Cellular systems(2G/2.5G/3G), WLAN/Wi-Fi, WiMAX, DSRC/WAVE, and Combined wireless access technologies) VANET characteristics, challenges and requirements, VANET applications and simulation tools.

The survey paper also indicates predictable mobility, Providing safe driving, improving passenger comfort and enhancing traffic efficiency, No power constraints, Variable network density, Rapid changes in network topology, Large scale network, High computational ability, as unique VANET characteristics. Discussion on the key VANET challenges and requirements, such as Signal fading, Bandwidth limitations, Connectivity, Small effective diameter, Security and privacy, and issues related to Routing protocols, is also included in the survey paper.

VANET applications: *comfort/entertainment* applications(is also referred to as non-safety applications, and aim to improve drivers and passengers comfort levels (make the journey more pleasant) and enhance traffic efficiency) and *safety application*(such as Intersection collision avoidance, Public safety, Sign extension, Vehicle diagnostics and maintenance, Information from other vehicles) with their real application is also discussed in the paper. Finally, the authors talk about the different VANET simulation tools.

### **Discussion points:**

- Privacy and security?
- Scalability and Robustness?
- VANET with cloudlet Vs VANET with fog computing?
- ICN to resolve the routing problem?

## **Title: Vehicular Cloud Networking: Architecture and Design Principles**

**Author:** Euisin Lee, Eun-Kyu Lee, Mario Gerla, Soon Y. Oh

The authors claim that emerging VANET applications and services require major changes to the underlying computing and networking models which demand network planning for VANET. Content size and location, focus on content not provider, and nodes dependency on their resources with minimum help from the Internet infrastructure are the Specially the inherent properties of VANET contents and the way that VANET applications consume the contents, impact various aspects in VANETs and will significantly change the computing (content generation-processing-consumption) and networking (content distribution) models. This leads to a future vehicular networking system: vehicular cloud networking (VCN).

In the paper it is indicated that Application Content Time-Space Validity, Content-Centric Distribution and Vehicle Collaboration Sharing Sensory Data are the three noticeable characteristics observed in emerging VANET applications. The authors claim that the existing VANET networking model, which has been derived primarily from traditional wired networking protocols, shows several intrinsic limitations. [1]VANET protocol still uses IP address to represent a host and the assignment requires infrastructure support such as DHCP [2] Since nodes join and leave the network frequently, it is difficult to discover IP address of the publisher of a specific content() and [3] VANET protocol simply performs IP-based end-to-end communications(router may delete a content needed by many nodes). Hence new research efforts , categorized as Vehicular Cloud Computing(VCC) and Vehicular Cloud Networking(VCN), has been proposed to VANET issues.

VCC, a variant of mobile cloud computing which begins from a conventional cloud computing model, leverages the increasing processing and storage capacity of vehicles. It constructs a cloud by using the collection of vehicles' computing resources, which primarily aim at extending the capability of interactions among vehicles and enables vehicles to discover and share their resources to create a vehicle cloud on which they collaborate to produce value-added services. ICN is leveraged, as a networking model, to disseminate cloud contents efficiently among vehicles. Then vehicular cloud networking, as a proposed future vehicular networking system, is built on top of them.

The authors have also discussed about VCN operations: Cloud resource discovery, cloud formation, task assignment and result collection, content publishing and sharing, cloud maintenance and cloud release, illustrated with an example scenario. Finally the paper discusses about VCN design principles in three perspectives: system, networking, and service.

### ***Discussion points:***

- Privacy and security?
- Virtual Machine Migration Problems?
  - What VMM strategies should we apply?
  - What resource reservation schemes in VMM process do we need to study to reduce service dropping?