

Email: dr.naseer.alquraishi[at]uowasit.edu.iq

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## 2. Motivation

Network is a characteristic wonder. Each creature and each biological community comprises of individual parts connected with each other in a way that improves and fortifies the entirety. All through history individuals have additionally framed systems keeping in mind the end goal to develop social contacts and exchange relations. The Industrial Revolution conveyed a formerly unanticipated quality to the connections inside of society. At the point when the quantity of specialized developments expanded and non-human vitality could be bridled and arranged, this significantly quickened the world in which we live and work. Sequential construction systems, power frameworks and rail interfaces notably expanded the rate and scope of both generation and circulation of products. The advanced unrest conveyed another measurement to organizing. An immense step came when PCs supplanted typewriters, getting rid of painted-over writing slips, carbon paper and cumbersome documents. Extensive scale handling and stockpiling of information changed our individual lives and financial movement. Spreadsheet counts reformed accounting, warehousing and generation. Be that as it may, there took after a considerably more prominent and more critical step: interfacing PCs and their clients with each other by means of the Internet. This empowered worldwide joined correspondence between clients in innovation, the educated community and society. In today's reality the lattice of connections between business, research and society is getting to be denser constantly. With versatile Internet gadgets, this overall change speaks the truth to make another quantum bounce forward. Individuals have additionally framed systems keeping in mind the end goal to develop social contacts and exchange relations.

## 3. Literature Review

Versatile Internet utilization has long been a piece of regular life for some individuals. They no more "go" on the web, they basically are online – notwithstanding when they are in their autos. Drivers of customized vehicles with access to the Internet and to their own particular information and media in the cloud will have an on a very basic level diverse driving background. Vehicle applications associated with online networking offer extra new potential outcomes [19, 20]. They expand the auto's level of personalization. Challenges in practical driving among the online "Social Community-IOV" group on the Internet is a virtual gathering of Internet clients. Typically the individuals have intrigues in like manner, convey through the Internet, and make their insight accessible for utilization in the group, and music to suit a driving style, are now reality. Notwithstanding all the Internet capacities that are showing up in autos, the vehicle is much more – truth be told it is turning into a home on vehicles [21, 22].

Cloud advances are making this conceivable. Since information no more must be put away on the PC's hard plate, however can be stopped adaptably on servers, vehicles – like other cell phones – can now likewise get to music, journals, movies, books et cetera. Travelers will like this in light of the fact that they are ensured a flood of stimulation on the secondary lounge. Computerized systems administration will offer countless open doors that nobody has considered yet. The truth of the matter is, autos will turn out to be considerably more customized than they are as of now, and

take their place flawlessly in the pattern of portable correspondence and opened [23, 24].

The vast majority see driving an auto as more than only getting from A to B. They need to have a positive ordeal of the voyage. Studies demonstrate that a blend of liveliness and comfort goes down particularly well. Insightfully joined vehicles and natural operation take weights off the driver, and another driving knowledge vanquishes the world. Driving is as of now an ordeal. A steady stream of advancements has made it more pleasing and agreeable than any other time in recent memory. Suspension, low commotion levels, agreeable seats that backing one's back, aerating and cooling, usefulness and simple operation are every established variable affecting client solace and comfort inside the vehicle. Various standard help frameworks have extraordinarily broadened this idea. Wellbeing elements, for example, non-freezing stopping devices and electronic solidness control, and helps, for example, the journey control, stopping colleague, programmed light control, downpour detecting windshield wipers, and tire weight checking are verging on underestimated these days [25, 26].

Advanced driver assistance systems (ADAS) are extra electronic frameworks in engine vehicles supporting the driver in certain driving circumstances. They frequently concentrate on security viewpoints or on expanded driving comfort than can be introduced in the auto develops with each passing year. Shrewd integration at last transforms the auto into an exhaustive administration supplier that knows the driver's necessities and gives help. This spares time and makes life less demanding for the driver. Computerized driving depicts the self-sufficient operation of a PC controlled vehicle in street activity. A self-sufficient vehicle is one that explores freely (that is, without backing from people). Such vehicles use different sensors to accumulate data about their surroundings, from which they can focus their position, explore towards a destination, and stay away from impacts in transit. The endless scope of new capacities gets its wake basic changes to the showcase and the controls inside of the vehicle. Driver help frameworks, data and administrations must be sorted out in a manner that does not divert the driver or risk general wellbeing. In the meantime, it ought to be conceivable to work the vehicle naturally and helpfully without expecting to comprehend the innovation, and the vehicle ought to have the capacity to sort approaching data by its importance to the present circumstance [27, 28].

Joined vehicles send and get individual information identifying with their drivers. This could hypothetically give data about who created a mishap. On account of organization autos, businesses could check the courses and breaks taken by the representatives, utilizing the vehicles to screen their staff. A far reaching legitimate information security system is needed for taking care of such touchy data. The circumstance is comparable in regards to robotized vehicles: who will be subject for harm brought about in a mischance, if the vehicle was being guided without the driver mediating? Associating the street movement requires a broad amendment of the legitimate structure before further advancements are made. Another test is hurled by the subject of whether future car applications ought to be taking into account open frameworks. Similarly as with open source programming, various inventive thoughts could be consolidated into autos

and the improvement of utilizations would then be more powerful and less expensive [29, 30].

Be that as it may, high wellbeing and security gauges apply in the car business, and each new application needs to agree to them directly down to the last detail. That is on account of information security likewise implies item security. There is additionally a legitimate measurement: on account of open source programming, various diverse players are included in the improvement of uses. In any case, here, on account of defective codes the car business would be obligated. Producers subsequently need to keep up control at all times over all frameworks utilized as a part of the vehicle. Broad confirmation is one choice for permitting space for some thoughts in mix with outright security. Portage and Bug Labs are as of now arranging an open source improvement stage for in-auto integration. The task advances the looking into of secure open source instruments with a specific end goal to push forward in-auto network all the more quickly [31, 32].

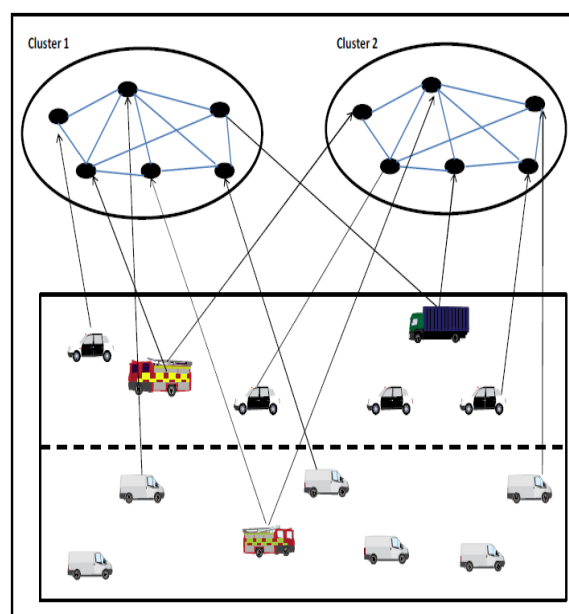
Against the foundation of dire worldwide difficulties, for example, populace development and environmental change, a key part will be played by joining vehicles with each other and with the framework. This is on the grounds that keen network can possibly address the individuals' issues for versatility and transportation, and to maintain a strategic distance from clogging regardless of developing volumes of activity. Network all the while satisfies individuals' longing to be "dependably on," even in their autos. Network makes activity and vehicles savvy and therefore more secure, more proficient and more advantageous. This will give great quality, low vitality utilization, and large amounts of wellbeing are imperative criteria influencing the choice to purchase an auto. On the other hand, incorporated correspondence advances have a developing part in such choices. Portable Internet access, as officially rehearsed by clients of cell phones and tablet PCs every day, is something shoppers are generally expecting progressively in vehicles, as well [33, 34].

Existing in-auto frameworks are as of now coordinates with each other, and versatile Internet access is accessible more habitually. New applications and administrations are getting to be built up. Car producers and suppliers are working seriously on further systems administration for vehicles. The following phase of advanced integration will connect the most changed method for transport, the base, cargo transport and individual portability necessities in one completely synchronized general framework. Joining and continuous coordination will make the utilization of movement data that beforehand was, best case scenario inaccurately connected, endlessly more proficient. So right from the start blockage, mishances and pointless outflows will be maintained a strategic distance from. This will diminish the weighty expenses of high activity volumes to the economy in general. Interfacing the street activity is not a future errand exclusively for the car business. This expansive change must be realized in participation with different commercial ventures and areas and with backing from lawmakers. For the commercial ventures included this advancement offers chances to grow new plans of action. What's more, about all commercial enterprises will profit by expanded effectiveness along the whole logistics chain. New organizations will offer ascent to already obscure cooperative energies [35, 36].

## 4. Proposed System

The system structure of IOV primarily incorporates four segments: OBU (On-Broad Unit), RSU (Road-Side Unit), CC (Control Center) and Internet, as demonstrated in Figure 1. The OBU has GPS situating module, vehicle state parameter procurement module, the V2V (Vehicle-to-Vehicle) correspondence module, the V2R (Vehicle-to-Road) correspondence module and information/yield gadgets. RSUs conveyed alongside the streets are in charge of the correspondence in the middle of vehicles and base, consequently the OBUs could trade the activity data with CC inside of the spread age region. Through Internet or satellites, the messages could be shown all the more generally and in the interim more data could be obtained.

An expanding number of auto producers are furnishing vehicles with locally available registering and remote specialized gadgets, in-auto sensors, and the worldwide situating framework (GPS) which may be utilized for the sending of substantial scale vehicular systems. While, because of different sorts of elements, for example, fast, dynamic topology, street condition and activity stream, the outline of directing conventions turns into one of the vital testing issues in IOV. On the other side, vehicles are not disengaged, so makeshift social relationship between vehicles has likewise brought advantage for directing choice.

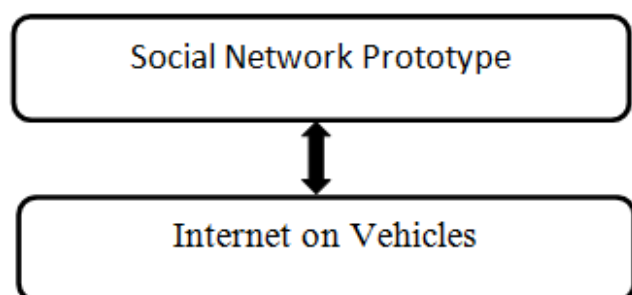


**Figure 2:** Connected vehicle for Social Network

Portable long range informal communication is person to person communication where people with comparable intrigues talk and unite with each other through their cell phones, as Facebook or Wechat. Portable informal communication happens in virtual groups, and it has a splendid application prospect. The portable informal organization taking into account vehicle correspondences may set up the intrinsic connections in the middle of vehicles and drivers through coupling the tag number with driver's telephone number without needing to assemble another vehicle system. The system construction modeling is straightforward and simple to understand the correspondence between vehicles. As indicated by the consistency of the development of autos in urban areas, this paper introduces a

layered system structure and a gathering directing convention in view of versatile social relationship between vehicles, which is called MSGR (Mobile Social Group Routing) convention. Unique in relation to the conventional gathering directing, our convention relies on upon both the geographic data and the development of vehicles conduct. Through the novel gathering system in view of brief social relationship between vehicle hubs, it can successfully diminish the directing deferral, particularly at the crossing points in urban environment.

Since an in number connection has been characterized between the system convention and vehicular versatility, the portability model is a basic angle in reproduction investigations of IOV. All around, vehicular portability models may be ordered into four distinct classes: Synthetic Models wrapping all models in light of scientific models, Survey-based Models removing versatility designs from overviews, Trace-based Models creating versatility designs from genuine versatility follows, lastly Traffic Simulators-based Models, where the vehicular portability follows are extricated from a nitty gritty activity simulator. It is vital to utilize a reasonable versatility demonstrate so that outcomes from the recreation can accurately mirror this present reality execution of IOV. A practical portability model ought to comprise of a reasonable topological guide which reflects distinctive densities of streets and diverse classifications of roads with different pace limits.



**Figure 3:** Framework of Social Network for Internet on Vehicles

The fundamental vision of Internet of Vehicle (IoV) is to prepare genuine vehicle objects with registering and correspondence control so they can collaborate with one another for social great. As one of the essential individuals from Internet of Vehicle (IoV), vehicles have seen steep progression in correspondence innovation. In this structure we instantiate IoV to characterize an informal organization of vehicles, where vehicles can share transport related security, proficiency, and solace notes with one another. We influence the framework set around Vehicular Ad-Hoc Networks (VANETs) to propose a building design for informal community of vehicles in the worldview of Social Network for Internet of Vehicles (IoV). We have recognized the social structures of vehicles, their relationship sorts, connections and the segments to deal with the framework. We likewise characterize the message or scrap structure taking after the Dedicated Short Range Communication (DSRC) standard. The paper closes with model usage points of interest of the message and the proposed structure alongside exploratory results. The steps of the proposed system shows in the below algorithms.

#### Algorithm:: Social Network for Internet on Vehicle

```

1: Procedure ConnectDataBaseToInsert(Query)
2:   Con=NULL, cmd=Query, dataset = 0, datatable = 0,
   dataadapter = 0
3:   while(Con!=NULL)
4:     If (cmd=Query)
5:       If (dataadapter != NULL)
6:         Insert data and close connection
7:       Endif
8:     Endif
9:   Endwhile
10: End Procedure

11: Procedure ConnectDataBaseToReturnDataSet(Query)
12:   Con=NULL, cmd=Query, dataset = 0, datatable = 0,
   dataadapter = 0
13:   while(Con!=NULL)
14:     If (cmd=Query)
15:       If (dataadapter != NULL)
16:         Fill dataset and close connection
17:       Endif
18:     Endif
19:   Endwhile
20: End Procedure

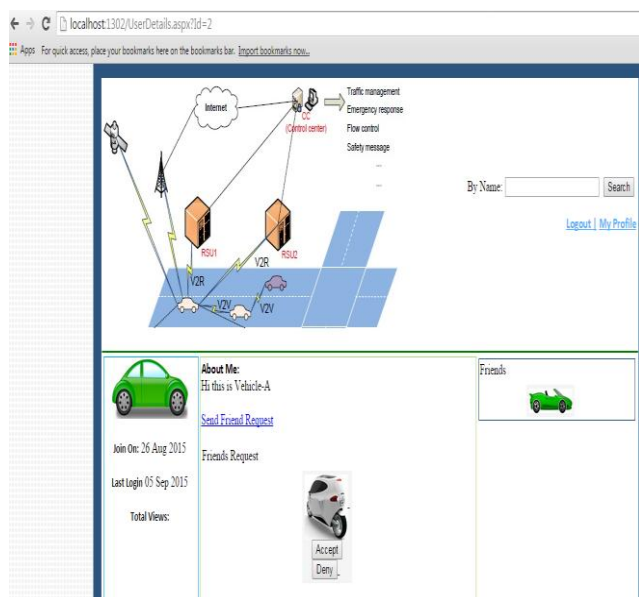
21: Procedure ConnectDataBaseToReturnDataTable(Query)
22:   Con=NULL, cmd=Query, dataset = 0, datatable = 0,
   dataadapter = 0
23:   while(Con!=NULL)
24:     If (cmd=Query)
25:       If (dataadapter != NULL)
26:         Fill DataTable and close connection
27:       Endif
28:     Endif
29:   Endwhile
30: End Procedure

31: Procedure LoginOnAuthenticate(Sender, TrafficEvent)
32:   Authenticated = 0, Event = TrafficEvent
33:   While(Authenticated !=0)
34:     If (Event!=0)
35:       ConnectDataBaseToInsert(Query)
36:       Post Event and close connection
37:     End if
38:   End While
39: End Procedure

```

This structure comprises two sections as interpersonal organization model and Internet on Vehicle in view of Vehicular Ad-hoc Network (VANET). So as to send IOV, this require wide selection of GPS gadgets on vehicles (e.g., Japan's vehicle route framework establishment rate is evaluated to be as high as 59%, while Europe and the United States are around 25% as per literature). Moreover, every vehicle must be outfitted with Wi-Fi interface and WWAN interface. IOV, an associated auto arrangement supplier, has proposed an open API to make the stage for the Internet of Cars. Since its utilizing Vehicular Ad-hoc Network (VANET), has utilized numerous items and administrations that make an associated auto biological system. The proposed API opens up IOV capacities to outsider designers and organizations. IoV innovation alludes to element portable correspondence frameworks that convey in the middle of vehicles and open systems utilizing V2V (vehicle-to-vehicle), V2R (vehicle-to-street), V2H (vehicle-to-human) and V2S (vehicle-to-sensor) associations. It empowers data sharing and the social occasion of data on vehicles, streets and encompasses. In addition, it includes the handling, registering, sharing and secures arrival of data onto data

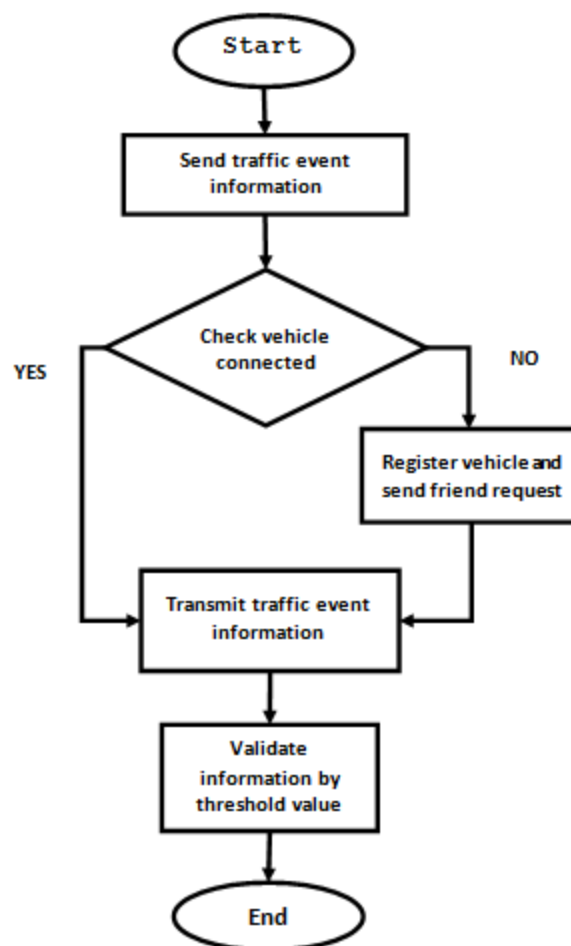
stages. In light of this information, the framework can successfully direct and regulate vehicles, and give bounteous sight and sound and versatile Internet application administrations.



**Figure 4:** Accepting Request from another Vehicle

Seen from the system point of view, an IoV framework is a three-level "Customer Connection-Cloud" framework. The customer framework is a vehicle's smart sensor, which accumulates vehicular knowledge and distinguishes driving status and environment. It is an omnipresent interchanges terminal that components intra-vehicle, between vehicle, and vehicle-system correspondence. It is additionally a gadget that empowers IoV tending to and achievement of a trusted vehicular character in the internet. The association layer locations V2V, V2R, V2H and V2I (vehicle-to-Internet) interconnectivity to acknowledge correspondence and meandering between impromptu vehicular systems (VANETs) and different heterogeneous systems. It guarantees continuous system universality as far as usefulness and execution. It is additionally a converging of open and private systems administration. The flowchart of social network for Internet on Vehicle shows in the figure 5.

The IoV is a cloud-based vehicle operation data stage. Its biological system covers ITS, logistics, freight/traveler transport, hazardous materials transport, vehicle repair/fitting, vehicle producing, vehicle dealership, vehicle supervision, protection, crisis salvage, and versatile Internet, making it a nexus for a mixed bag of extensive information sources. Cloud-based capacities, for example, virtualization, validation, constant communication, and mass stockpiling are subsequently needed. Its application frameworks additionally incorporate vehicle information social occasion, figuring, booking, observing/control, administration, and applications.

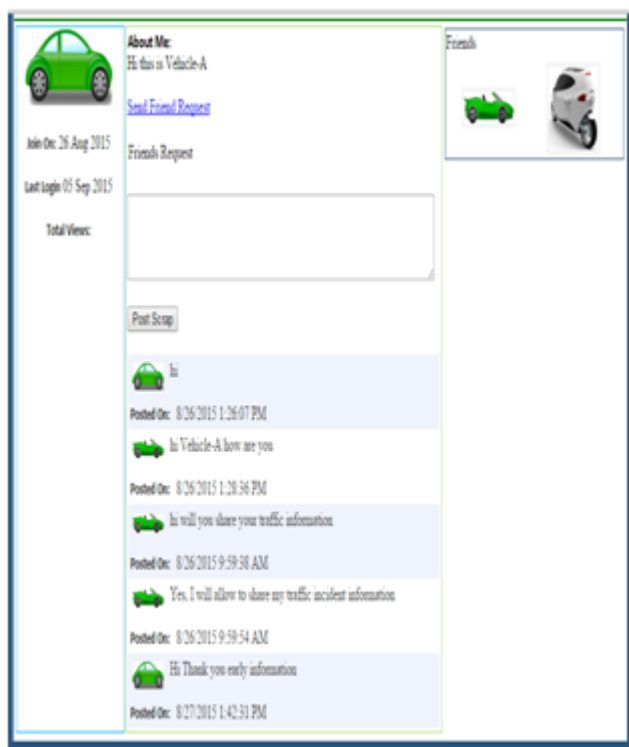


**Figure 5:** Flowchart of social network for Internet on Vehicle

Practically speaking, rather than pre-constructed informal communities, there exists colossal need of building interpersonal organizations suddenly from vehicles. The development of such interpersonal organizations over vehicle in the occasions or at areas, for example, meetings, compositions, and eateries empowers individuals to convey and share their encounters without the need to have Internet access and with least obliged foundation. To address this need, we propose an informal community system for Internet on Vehicle. This framework shifts from the current informal communication original towards a Vehicular specially appointed system (VANET) that conceivably associate a wide range of vehicle that are furnished with short-extend correspondence medium, for example, DSRC. Not at all like customary interpersonal organizations in which social groups are pre-fabricated from genuine connections, are clients in this system consequently assembled by their social practices. This raises the test of finding clients of comparative social examples as displayed in Figure 4 and 6.

#### Requirements of Proposed System:

This is an open source proposed named as Social Network for Internet on Vehicle. In this framework we are demonstrating along range interpersonal communication site usefulness for Internet on Vehicle. In this Vehicle can make own profile, look other vehicle profiles by name, oversee companion vehicle's system by sending companion demand, vehicle can likewise message with other vehicle.



**Figure 6:** Checking profile for traffic incident

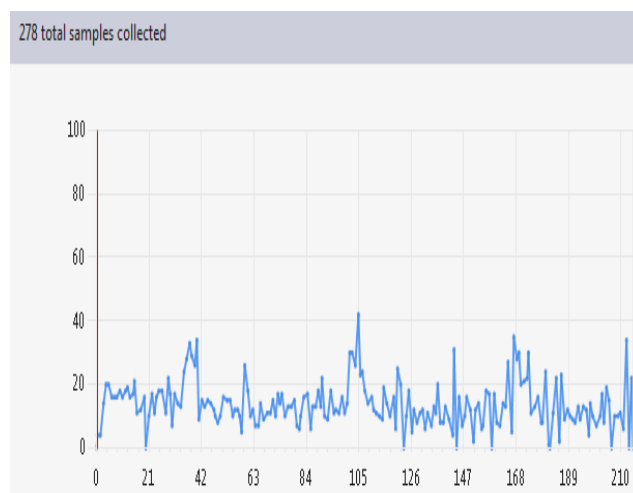
We made this application in .NET 3.5 and our database is in SQL Server 2008. We have my database in application envelope App\_data. To run this application simply append this database on any machine and change the association string in App\_Code -> DataBaseClass.cs. This is our database layer class.

Presently when we run the application, the first run through the login page will demonstrate. Vehicles have officially enrolled with the site, and then enter their Email id and secret word and the application will divert to vehicle profile page. Also, if vehicle don't have a record then tap on Not Registered Yet?. This will divert vehicle to enlistment page.

## 5. Result and Discussion

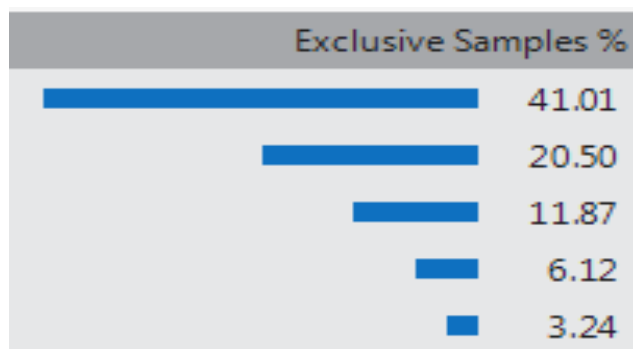
We assemble a straightforward Social Network model for Internet on Vehicle to assess its execution in a proposed domain. We make 6 vehicle clients with a vehicle as vehicle's customers. These customers keep running on the windows working framework. Every customer is altered as a vehicle driver, and draws power from the vehicle. At the point when the vehicle is moving, the customer sweeps and endeavors to partner to the next vehicular specially appointed system. When it effectively connects with different vehicles, the vehicle customer uses a prestored guide to make sense of the substantial name and location that it can utilize. We pre-load the mapping in the middle of vehicle and VANET subnet on all vehicle customers to decrease the overhead of message procurement. Comparable enhancement should be possible on Internet on Vehicle, as the vehicle customer and VANET can trade movement data and verification data by means of WWAN API before they meet. Figure 4 and 5 give a depiction of the framework. The Internet on Vehicles can keep running around from both headings around the accessible VANET. The normal time for a vehicle to send activity data message is low. More than 278 specimen contact

insights are gathered from more than 6 vehicle clients over a 2 month period. The mean vehicle client contact length of time is around 15s with mean contact limit around 4.5MB, while the mean vehicle to another vehicle contact term is around 11s with the mean contact limit around 3.2MB as displayed in Figure 7.

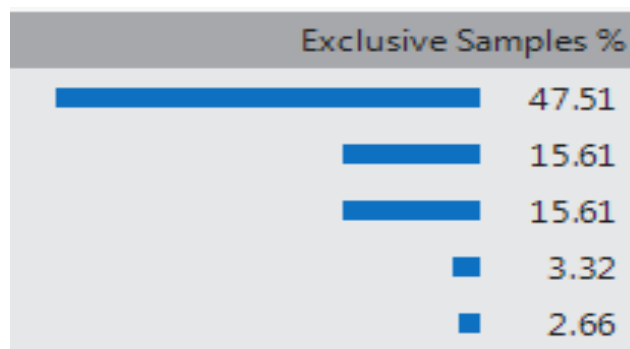


**Figure 7:** Performance evaluation for vehicle to fixed network connection

Leaving applications, for example, Jambo Networks and Nokia Sensor build companionship connection between versatile clients by mapping watchwords installed in their client profiles. In any case, the interpersonal organization may comprise of different sorts of vehicles and different clients may utilize distinctive vocabularies and arrangements, as a result, information in the system will probably be of various configurations. Hence, the watchword based coordinating system can't adequately find social examples from heterogeneous client profiles. To dodge these issues, interpersonal organization for Internet on Vehicle proposes a semantics-based matchmaking plan for finding comparable vehicle clients. The semantics-based matchmaking adds machine-available semantics to the framework. It utilizes cosmology to examine client profiles and application information that empowers the derivation of relationship and similitude in the middle of clients and assets. In this manner, it permits trade of heterogeneous social information without loss of importance between different applications and/or client profiles of various sorts, and significantly enhances the interoperability between assorted gadgets and information. Because of versatility, restricted battery force, compelled data transfer capacity, absence of concentrated control, and specific foundation interest, developing a specially appointed interpersonal organization postures new outline difficulties contrasted with customary online informal communities. This structure addresses these difficulties by proposing a semantics-based multi-jump steering convention for informal organization development and question sending that endeavors the connections between the overlay directing and physical steering conventions to improve the steering execution as introduced in Figure 8.

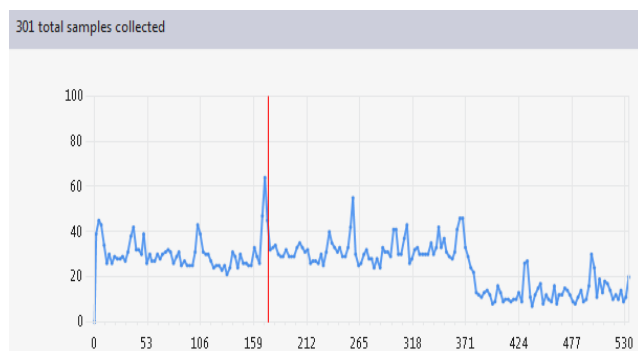


**Figure 8:** Performance evaluation for successful delivery message from fixed network



**Figure 10:** Performance evaluation for successful delivery message from fixed network

The system go between segment can quantify the comparability (a) between client profiles and (b) in the middle of questions and assets. Given two client profile examples, the system relational arranger has the capacity overcome contrasts in vocabularies and can bolster surmising instruments. For example, a client intrigued by "vehicular impromptu systems" (superclass of "specially appointed system") can be coordinated with another client inspired by "impromptu systems". On the other hand, a client inspired by "shared processing" can likewise be gathered to be occupied with "conveyed frameworks". This is giving correspondence message between two vehicles specifically. More than 301 specimen contact measurements are gathered from more than 6 vehicle clients over a 2 month period. The mean vehicle client contact length of time is around 25s with mean contact limit around 4.5MB, while the mean vehicle to another vehicle contact term is around 21s with the mean contact limit around 3.2MB as exhibited in Figure 9.



**Figure 9:** Performance evaluation for vehicle to vehicle connection

We start to assess this system by first recording the adequacy of our comparability measure for another vehicle revelation. We contrast our philosophy based similitude measure and without semantics definite match. For the precise match-based inquiry, a question just matches decisive words without considering the magic words' particular implications in the metaphysics or the connections between watchwords.

Figure 10 portrays the discoveries of our arrangement of execution for fruitful conveyance message. As it can be seen, our coordinating method distinguishes multifold more important vehicle message contrasted with the careful coordinating. This is just on the grounds that our comparability capacity measures the likeness on the semantic level as opposed to the language structure level. We likewise watch that when the closeness edge diminishes, the quantity of results increments. This relationship remains constant in light of the fact that more important relations can be recognized. This relationship additionally is a vital property when a given informal community might not have numerous members. Along these lines, Vehicle clients may have the influence to unwind the criteria for companion coordinating to develop an informal organization with scanty client populace. (A choice that is not accessible in any of the presently existing informal communities.) Moreover, in light of the fact that ontological hunt wipes out the semantic vagueness issue, for example, polysemy and homonymy, results returned are important with greatly high accuracy.

## 6. Conclusion

The paper portrays a system of informal organization model for web of vehicles, as a convincing utilization instance of Vehicular Ad-hoc Network. The proposed system characterizes imperative segments, their collaborations, and interrelations, which are enlivened from the structure of Social Network. A structure of cooperation message is given which receives DSRC models correspondence that can bolster different applications, for example, wellbeing, proficiency, and infotainment. We likewise give usage methodology of the message structure and the proposed informal community system alongside trial execution results and perceptions. In our future works we need to concentrate on adaptability investigation and improvement elements. Outlining a non-meddlesome system interface is one of the principle difficulties to present security messages to the driver. Other vital issues incorporate information excess, and synchronization.

## References

- [1] Atzori, L., Iera, A., & Morabito, G. (2011). Siot: Giving a social structure to the internet of things. *Communications Letters, IEEE*, 15(11), 1193-1195.
- [2] Atzori, L., Iera, A., Morabito, G., & Nitti, M. (2012). The social internet of things (siot)—when social networks meet the internet of things: Concept, architecture and

- network characterization. *Computer Networks*, 56(16), 3594-3608.
- [3] Dong, Y., Hu, Z., Uchimura, K., & Murayama, N. (2011). Driver inattention monitoring system for intelligent vehicles: A review. *Intelligent Transportation Systems, IEEE Transactions on*, 12(2), 596-614.
- [4] Feld, M., & Müller, C. (2011, November). The automotive ontology: managing knowledge inside the vehicle and sharing it between cars. In *Proceedings of the 3rd International Conference on Automotive User Interfaces and Interactive Vehicular Applications* (pp. 79-86). ACM.
- [5] Guinard, D., Fischer, M., & Trifa, V. (2010, March). Sharing using social networks in a composable web of things. In *Pervasive Computing and Communications Workshops (PERCOM Workshops)*, 2010 8th IEEE International Conference on (pp. 702-707). IEEE.
- [6] Holmquist, L. E., Mattern, F., Schiele, B., Alahuhta, P., Beigl, M., & Gellersen, H. W. (2001, January). Smart-its friends: A technique for users to easily establish connections between smart artefacts. In *Ubicomp 2001: Ubiquitous Computing* (pp. 116-122). Springer Berlin Heidelberg.
- [7] Hu, X., Leung, V., Li, K. G., Kong, E., Zhang, H., Surendrakumar, N. S., & TalebiFard, P. (2013, November). Social drive: a crowdsourcing-based vehicular social networking system for green transportation. In *Proceedings of the third ACM international symposium on Design and analysis of intelligent vehicular networks and applications* (pp. 85-92). ACM.
- [8] Gerla, M., & Kleinrock, L. (2011). Vehicular networks and the future of the mobile internet. *Computer Networks*, 55(2), 457-469.
- [9] Abrahams, A. S., Jiao, J., Wang, G. A., & Fan, W. (2012). Vehicle defect discovery from social media. *Decision Support Systems*, 54(1), 87-97.
- [10] Yu, R., Zhang, Y., Gjessing, S., Xia, W., & Yang, K. (2013). Toward cloud-based vehicular networks with efficient resource management. *Network, IEEE*, 27(5), 48-55.
- [11] Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, 29(7), 1645-1660.
- [12] Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business horizons*, 54(3), 241-251.
- [13] Lim, M. (2012). Clicks, cabs, and coffee houses: Social media and oppositional movements in Egypt, 2004–2011. *Journal of Communication*, 62(2), 231-248.
- [14] Aksen, J., & Kurani, K. S. (2012). Interpersonal influence within car buyers' social networks: applying five perspectives to plug-in hybrid vehicle drivers. *Environment and Planning-Part A*, 44(5), 1047.
- [15] Lim, M. (2012). Clicks, cabs, and coffee houses: Social media and oppositional movements in Egypt, 2004–2011. *Journal of Communication*, 62(2), 231-248.
- [16] Sha, W., Kwak, D., Nath, B., & Iftode, L. (2013, February). Social vehicle navigation: integrating shared driving experience into vehicle navigation. In *Proceedings of the 14th Workshop on Mobile Computing Systems and Applications* (p. 16). ACM.
- [17] Nitti, M., Girau, R., Atzori, L., Iera, A., & Morabito, G. (2012, September). A subjective model for trustworthiness evaluation in the social internet of things. In *Personal Indoor and Mobile Radio Communications (PIMRC)*, 2012 IEEE 23rd International Symposium on (pp. 18-23). IEEE.
- [18] Berthon, P. R., Pitt, L. F., Plangger, K., & Shapiro, D. (2012). Marketing meets Web 2.0, social media, and creative consumers: Implications for international marketing strategy. *Business horizons*, 55(3), 261-271.
- [19] Nah, S., & Saxton, G. D. (2012). Modeling the adoption and use of social media by nonprofit organizations. *New Media & Society*, 1461444812452411.
- [20] Gerla, M. (2012, June). Vehicular cloud computing. In *Ad Hoc Networking Workshop (Med-Hoc-Net)*, 2012 The 11th Annual Mediterranean (pp. 152-155). IEEE.
- [21] Coiera, E. (2013). Social networks, social media, and social diseases. *BMJ*, 346.
- [22] Chu, S. C., & Kim, Y. (2011). Determinants of consumer engagement in electronic word-of-mouth (eWOM) in social networking sites. *International journal of Advertising*, 30(1), 47-75.
- [23] Michaelidou, N., Siamagka, N. T., & Christodoulides, G. (2011). Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands. *Industrial Marketing Management*, 40(7), 1153-1159.
- [24] Fei, R., Yang, K., & Cheng, X. (2011, April). A cooperative social and vehicular network and its dynamic bandwidth allocation algorithms. In *Computer Communications Workshops (INFOCOM WKSHPS)*, 2011 IEEE Conference on (pp. 63-67). IEEE.
- [25] Tan, W., Blake, M. B., Saleh, I., & Dustdar, S. (2013). Social-network-sourced big data analytics. *IEEE Internet Computing*, (5), 62-69.
- [26] Patton, D. U., Eschmann, R. D., & Butler, D. A. (2013). Internet banging: New trends in social media, gang violence, masculinity and hip hop. *Computers in Human Behavior*, 29(5), A54-A59.
- [27] Tang, L., & Sampson, H. (2012). The interaction between mass media and the Internet in non-democratic states: The case of China. *Media, Culture & Society*, 34(4), 457-471.
- [28] Khondker, H. H. (2011). Role of the new media in the Arab Spring. *Globalizations*, 8(5), 675-679.
- [29] Lovejoy, K., & Saxton, G. D. (2012). Information, community, and action: how nonprofit organizations use social media\*. *Journal of Computer-Mediated Communication*, 17(3), 337-353.
- [30] Choi, H., & Varian, H. (2012). Predicting the present with google trends. *Economic Record*, 88(s1), 2-9.
- [31] Lim, M. (2012). Clicks, cabs, and coffee houses: Social media and oppositional movements in Egypt, 2004–2011. *Journal of Communication*, 62(2), 231-248.
- [32] Civiljak, M., Stead, L. F., Hartmann-Boyce, J., Sheikh, A., & Car, J. (2013). Internet-based interventions for smoking cessation. *Cochrane Database Syst Rev*, 7.
- [33] Lovejoy, K., & Saxton, G. D. (2012). Information, community, and action: how nonprofit organizations use social media\*. *Journal of Computer-Mediated Communication*, 17(3), 337-353.
- [34] Logsdon, M. C., Bennett, G., Crutzen, R., Martin, L., Eckert, D., Robertson, A. & Flamini, L. (2014). Preferred health resources and use of social media to obtain health

- and depression information by adolescent mothers. *Journal of Child and Adolescent Psychiatric Nursing*, 27(4), 163-168.
- [35] Nielsen, R. K. (2013). Mundane Internet Tools, the Risk of Exclusion, and Reflexive Movements—Occupy Wall Street and Political Uses of Digital Networked Technologies. *The Sociological Quarterly*, 54(2), 173-177.
- [36] Leonardi, P. M., Huysman, M., & Steinfield, C. (2013). Enterprise social media: Definition, history, and prospects for the study of social technologies in organizations. *Journal of Computer-Mediated Communication*, 19(1), 1-19.
- [37] Koteyko, N., Hunt, D., & Gunter, B. (2015). Expectations in the field of the Internet and health: an analysis of claims about social networking sites in clinical literature. *Sociology of health & illness*, 37(3), 468-484.
- [38] Mascia, D., Magnusson, M., & Björk, J. (2015). The Role of Social Networks in Organizing Ideation, Creativity and Innovation: An Introduction. *Creativity and Innovation Management*, 24(1), 102-108