IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

9940 572 462 | 6381 907 438 | ijircce@gmail.com | www.ijircce.com

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

A Study on Wi-fi and WiMAX on VANETs

Junias Kennedy

Guest Faculty, Department of Computer Applications, SCMS School of Technology & Management

Cochin, Kerala, India

ABSTRACT: With the persistent development of wireless communication technology and vehicle industry VANET as of recent is one of the foremost research niches. VANET could even be a technology that creates use of motion vehicles as a node during a network for the creation of a mobile network. Although there's a detailed characteristic between VANET and MANET (Mobile Ad-Hoc Networks), VANET has special features that differentiate it from MANET. VANET is a vehicle to vehicle and vehicle to infrastructure communication. VANET also certify there is no break of routing path before the transmission end. VANET could even be a challenging domain that has created a platform for several applications to hunt out their place. Sufficient time remains needed for the implementation of large-scale practical though this field has been under rigorous study for over 20 years . the likelihood of getting vehicular connectivity has been triggered by the ever- increasing wireless connectivity and computational ability of recent vehicles. Many potential vehicular network applications are proposed in several slots like information, safety, entertainment and traffic infrastructure management. These application requires available wireless medium utilization of both new and existing wireless technologies. VANET comprises of two technologies mentioned as WiMAX and Wi-Fi. The goal of this survey was to figure out the sole technology among the 2 technologies. In other to know this goal, a radical investigation was administered in conjunction with an evaluation on V2V2I VANET where Wi-Fi was used for amid vehicle (V2V) interaction and WiMAX used for vehicle to infrastructure (V2I) interaction. This survey begins with the VANET architecture, then deals with the characteristics and challenges of VANET, applications, before ending with a comparison of the two technologies that made up of VANET, the experimental approaches used, future perspectives, result and conclusion.

KEYWORDS: Vehicle to Infrastructure, Wi-Fi, VANET, WiMAX.

I. INTRODUCTION

With the continual development of wireless communication technology and vehicle industry VANET as of recent is one of the most research niches. VANET, a technology that makes use of motion vehicles as a node in a network for the creation of a mobile network. Vehicle safety measures provisions is the goal of VANET, and this technology is created by the movement of vehicles and (RSUs), that is stationary roadside units furnished with wireless communication devices (short range). There is a vehicle to infrastructure and amid vehicle interaction in the network [1-3]. What drives the (V2V) interaction is the Intelligent Transportation System development and deployment[4] which intent at improving the condition of traffic and reduction of an accident by offering drivers and users of vehicles information. Figure 1 shows main diagram of an Ad-hoc Network using Vehicle (VANETs)

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

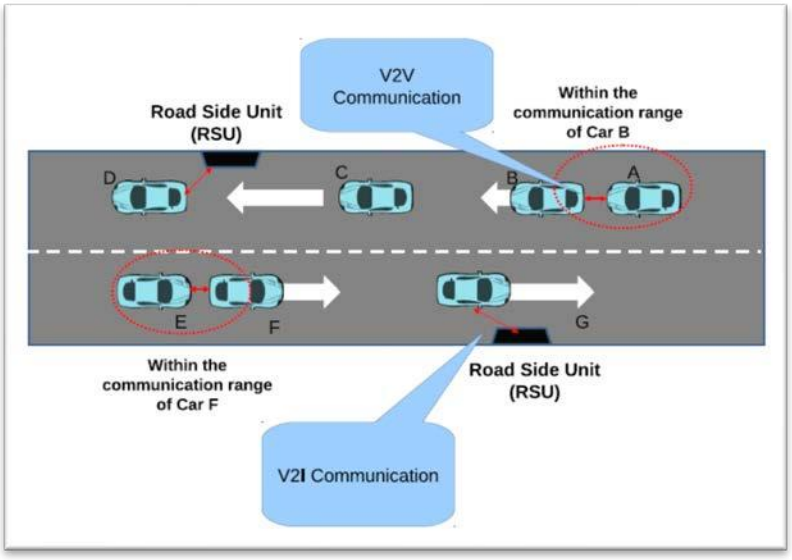
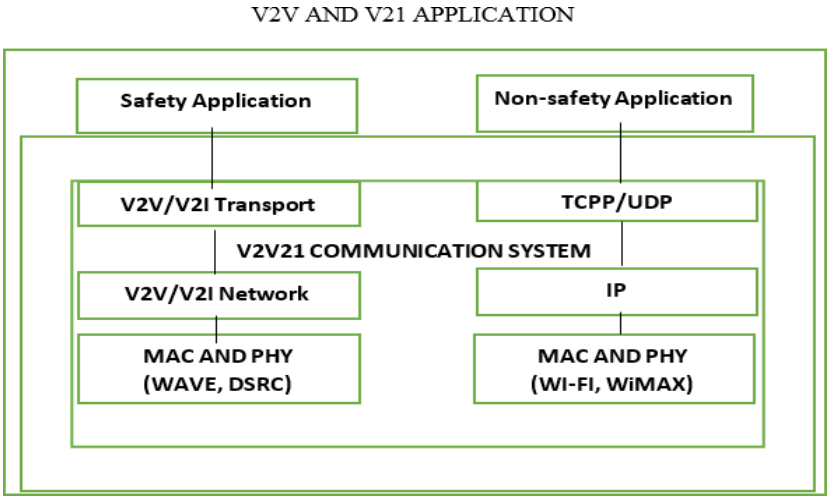


Figure 1: main diagram of an Ad-hoc Network using Vehicles (VANETs)

There are many scheduled applications for VANETs which are of two types namely the safety and non- safety [5]. The safety application gives out essential and safety information from other vehicles sensor data or from stationary roadside units (RSUs) to avoid and report issues such as road conditions and maintenance information, immediate brake warning delivered from a prior remote vehicle and accident announcement. Online connectivity, entertainment and general traffic management are few non-safety applications [7, 8] and they derive their data on-demand [6]. Video streaming, file sharing, electronic payment and audio are the few examples. Figure 2 shows V2V2I system parts and operation.

Figure 2: V2V2I system parts and operation



The VANET nodes come across direction changes, sudden speed and high mobility attribute, unlike the nodes in MANETs leading to very swift changes in network topology [1, 9]. These influenced different challenges, like multipath fading, message routing techniques, degradation of the signal [10] and others. An important factor is the putting of message as a priority when one medium of the network is shared: these safety applications must have higher priority, however, there might have been an over flooding of non-safety application in the network resulting to lag of safety and critical vehicle messages. One of the important ways of overcoming these challenges is by separating the via a cross-layer architecture application [11]. Different safety application can make use of newly launched IEEE 802.11p, while Wi-Fi and WiMAX which are existing standards could be useful for different non-safety applications. Improved system performance and good usage of resources will be provided by this architecture

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

[11]. The basic standard of wireless and local area, short-range network protocol (Wi-Fi) is an IEEE 802.11 network. It operates an unauthorized 2.4 GHz radio frequency providing over 120 Mbps (IEEE 802.11n) high data rates. WiMAX has basis on the IEEE 802.16 standard.

II. VANETs COMMUNICATION ARCHITECTURES

Definition of Architecture was often considered a serious issue by different organizations, just like the International Standard Organization (ISO) and IEEE [14]. The task of designing 4 major standards (CALM, ARIB, C2C, and WAVE) began in parallel but lacking major coordination and collaboration and coordination. various political forces, regional agencies, and car manufacturers support different standards.

2.1. CALM

ISO began its personal standard referred to as Calm which stands for (Communications, Air-interface, and Long and Medium range). This complex pattern deal on uninterrupted node interaction or communication. CALM launched any interface that's available at the MAC layer before other standards. Yet, there are many other MAC interfaces available to researchers.

2.2. C2C

The automobile industry in Europe supported a VANET standard under GEoNEt label via C2C- CC (Car-2-Car Communication Consortium). It aims at different active safety applications. it's not an equivalent with the web architecture and it backs different open interfaces at the PHY layer and MAC layer.

2.3. WAVE

IEEE began its operation with WAVE label. WAVE (Wireless Access in Vehicular Environment) has its basis on the present internet model despite being a complete protocol stack. there's no main large-scale implementation available aside from the small-scale projects and test laboratories [15]. Moreover, only IEEE 802.11p MAC is permitted by WAVE for each communication that's regarded by many researchers as a bottleneck.

2.4. ARIB

ARIB gave definition to several VANET architectures and relied mainly on WAVE. ARIB-2001 which was the primary ARIB standard uses one MAC layer at 700MHz band while ARIB-2004 uses a 5.8 GHz band. ARIB (The Association of Radio Industries and Businesses) a bit like WAVE has its specialize in emergency VANET messages.

III.VANETs CHARACTERISTICS AND CHALLENGES

VANET was initially considered as a sub-class of MANET, most studies and developments related to MANET are put into practice use to VANET. Nevertheless, there have been differences between the 2 classes of the network from subsequent progress. VANET model design for privacy, interaction, and security haven't any direct comparison with MANET. many sorts of research were carried out to form emphases to VANET issues especially [12, 13]. This doesn't in any way solve all challenges; there are still many challenges where researches can perform research to supply an optimum solution as a results of VANET not being implemented at a much bigger scale.

Routing and Data Dissemination in VANETs

The following are the abstract of routing and data dissemination in VANETs

• The state of real-life traffic isn't taken into consideration before routes are determined by different protocols.

• Every realistic traffic maintenance and conditions can’t be met via the present and different VANET routing protocols.

• Utilization of routing protocols that are timely tolerant is susceptible to degradation within the course of disconnected scenarios.

• Under quick and inconsistent VANET topologies, all topology-based routes lack efficiency.

• Though proactive routing approaches offer low latency, there's an underutilization of network resources as a results of unused paths.

• Though reactive routing protocols offer better resource utilization, the main limitation is latency in route determination.

• Partitioning of network and correct updating of location information result to network resource wastage.

• There could also be incorrect emergency alerts caused by the inherent latency of GPS under high- speed movement [10].

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

Efficient routing has its specialize in 3 major goals:

• Getting the simplest route from its wellspring to final abode efficiently
• New route updating at run time when a far better one is out there .
• Route maintenance especially when there's a route failure

The following are the three primary questions routing algorithms specialize in when finding a route among 2 routes:

• What metrics or information need to be shared for route determination?
• When the knowledge and the way the knowledge is chosen need to be shared inside the network?
• what is the way to determine the route using the shared information?

VANETs Applications and Classification

The drive of amid vehicle communication is roadway safety but bigger mobile applications and other bigger scale applications have also been presented by VANET. Different applications in transportation like traffic monitoring and updates are expected from VANET. the main 3 VANET applications are safety, infotainment and traffic applications. Gathering and manipulation of knowledge from roadside units and other vehicles are works of the traffic application, safety applications which depends on broadcast interaction are made from low latencies that are transmitted across short distances and infotainment applications comprises of huge payload information that needs high data rates.

Wireless Access Methods in VANETs/Access Technologies

This exploit commended a scheme that applies a joining together of Wi-Fi and WiMAX to persistently equip the mutual vehicle and V2I connectivity VANET. To make sure that vehicular network is a perfect information mix amid node extremities of a network expects, amongst other additional features, the node mobility comprehension under dissimilar surrounding conditions. The try was made from two vehicles that are related with a stationary place post and ad-hoc Wi-Fi association with a fanatical WiMAX association to a single-vehicle. Wi-Fi and ad- hoc manner allowed the devices to pass on with one another without the exercise of AP (access point), and every device in orbit associate in a P2P manner. With the provision of extended coverage by WiMAX, it was decided and Wi-Fi as a result of being easy to access and similarity to the coming IEEE 802.11p measure gotten specifically for utilization in VANETs. There was a configuration of observational apparatus chew over conditions release in an environment (urban) correctly.

Short/Medium Range Wireless Technologies--Wi-Fi Configuration (IEEE 802.11n)

Wi-Fi ad-hoc network was utilized during this setup thanks to the operational expectations of future vehicular networks during this fashion. There was direct communication among the devices during a p2p fashion. the first limitation in ad-hoc mode is that the depreciating performance of the network thanks to the expansion of the amount of devices. However, just 2 models are permitted to speak during this experiment. Every wireless adapter in an ad-hoc network is supposed to utilize identical channel number and SSID. Since Wi- Fi works on 2.4GHz unauthorized waveband , the likelihood of getting interference from both Wi- Fi devices and other devices like TV remote controls and Bluetooth is high. Identical 2.4GHz waveband is employed by TV remotes control and therefore the Bluetooth. Comparing it to IEEE 802.11g, Wi- Fi (IEEE 802.11a) offers an inadequate performance. The transmission range, generally , was shorter. This will lead to insufficient data successfully transferred and short contact time. This has made Wi-Fi to be chosen for V2R communication architecture.

Wide/Long Range wireless technologies—WiMAX Configuration (IEEE 802.16d)

WiMAX was launched by the WiMAX Forum with a target of conceiving a system for mobile and glued broadband combination wireless access. The WiMAX Forum currently comprises of fixed system profile (IEEE 802.16d-2004) and mobile system profile (IEEE 802.16e-2005). Breeze Max selfinstall (Si) 1000 CPE and Alvarion BreezeMax TDD Micro (BS) were used for the WiMAX link. The (Si) CPE was developed to be used indoor. It uses Intel PRO or Wireless 5116 broadband interface chip. It provides full 360° coverage thanks to its fast bi-directional switching matrix. Utilization of various or same antennas to sending and receiving information was made possible by the bi-directional (double) switching matrix. The Si CPE was linked to the private computer via the 10/100 base T port. The Si supports 64QAM, 16QAM, BPSK, 1/2, 2/3, ¾ coding modulation technique and QPSK to monitor the coding schemes and modulation, uplink and downlink quality are monitored regularly. The BS chooses a modulation technique of the aforementioned coding by making use of multirate algorithm link quality information that has Signal to Noise Ratio, Burst Error Rate and multipath gotten from the SU. Both the bottom

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

Station (BS) and SU work with the IEEE 802.16d standard that operates at 2.5GHz waveband and utilizes time division doubling with a 5MHz channel bandwidth.

IV.COMPARISONS OF Wi-Fi AND WiMAX

- Wi-Fi connection is slower than WiMAX
  - Both technologies have reliable and straightforward QoS.
  - The distance and speed of a network are the most difference between the two technologies.
  - While Wi-Fi features a limited access point, WiMAX has no access point.
  - WiMAX features a medium band with unlike Wi-Fi that has less bandwidth.
  -

Table 1: Technical comparison of Wi-Fi and WiMAX

Standard	WiMAX	Wi-Fi
Family	802.16	802.11
Application (primary)	Broadband wireless access	Wireless LAN
Channel Bandwidth	1.25 M to 20 MHz (Adjustable)	20 MHz
Radio Technology	OFDM (256-channels)	OFDM (64-channels)
Uplink (Mbit/s)	56 in 20 MHz bandwidth	300 in utilizing 4x4 configuration in bandwidth of 20MHz
Access Protocol	Request/Grant	CSMA/CA
Frequency Band	2 G to 11 GHz (Licensed and Unlicensed)	2.4 GHz ISM (g) 5 GHz U-NII (a)
Downlink	128 in 20 MHz bandwidth	600 in utilizing 4x4 configuration in 40MHz bandwidth
Basis use	Used for mobile Internet	Used for mobile internet

V. EXPERIMENTAL SETUP AND APPROACH

An investigation was done on the combined performance of WiMAX network protocol and Wi-Fi wireless protocol to offer mutual vehicle and vehicle to infrastructure connectivity respectively in VANET. The experiment was made from two connected vehicles. Both vehicles are united with a stationary base station and ad-hoc Wi-Fi, a fanatical WiMAX was also connected to at least one vehicle. it had been well-designed to reflect correctly the resent conditions in an urban environment. This survey has its specialise in scenarios that support the movement of vehicles during a particular direction and in opposite directions. Stellenbosch University campus was the place where the experiments were taken place on the 2 different routes inside WiMAX Base Station range. 60km/h is that the authorized regulation on these 2 routes. the primary route isn't faraway from the BS in line Of Sight of the WiMAX Base Station range while the second route is of farther from the WiMAX network Base Station home in the town centre. This city center represents non-line of sight. Early tests were administered to determine the individual evaluation of Wi-Fi and WiMAX since both technologies were involved. Tests on the combined technologies were done later.

- For the test was carried out only on Wi-Fi wireless network communications
  Vehicles occupation one and opposite directions on V2V following, V2V crossing and V2I were administered .
- For the test was carried out only on WiMAX network communication
  The vehicle that was used by the WiMAX network was moved in both routes.
- For the entire test utilizing both wireless protocols communications

Two tests on both direction and other way was administered on both routes. Also, another test was administered when the two vehicles were on an equivalent direction (following) for a distance of fifty km with speeds close 120 km/h on a route (highway). during this test, the separation range was also kept under 300 meters. For this specified test, the WiMAX connection, unlike the active Wi-Fi connection. to feature to the performance results (quantitative link), both the amid vehicle and V2I configuration was equally utilized within the qualitative evaluation of the link using audio and video streaming amid the vehicles first, it had been seconded from the BS to the WiMAX enabled vehicle and eventually from the bottom Station via the vehicle enabled by WiMAX to others. Each vehicle was

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

provided with a private computer along side an external Wi-Fi adapter. These external adapters were installed at the outside of the vehicles to supply to reinforce coverage and LOS. WiMAX Base Station were installed on a tall building. the private computer used composed of GPS dongle for monitoring the speed and position of the vehicles. the subsequent were recorded during the experiment:

- Relative speed
- Both technologies signal strength
- Both technologies modulation type
- The separation amid the vehicles
- The separation from the bottom Station
- The data transferred
- Jitter
- The contact time from the primary to the ultimate packet received

VI.FUTURE PERSPECTIVES IN VEHICULAR NETWORKS

This survey shows the higher scenario in VANAT where there are 2 communicating nodes at the absence of users collision and contention. Knowing the evaluation of where there are two nodes trying to speak would be beneficial and intrinsically would require future investigation under denser scenarios to understand the evaluation of multiple vehicles sharing one medium. the use of both wireless technologies needs further experiment to deduce additional and real-time behavioural communication in VANETs. Also, there would be a requirement for an extra experiment to understand the implications within the use of the many non-wire technologies and the way to manage their coexistence.

VII.RESULT AND CONCLUSION

The execution of Wi-Fi related with the execution or performance of WiMAX was greatly suitable and recommendable. The challenges araised in Wi-Fi are solved using WiMAX. the main challenge facing Wi-Fi is that the restricted area which isn't so in WiMAX that has no area restriction. Both network technologies are trusted and reliable. Infotainment diligences feasibility in VANETs calculates not only on the functionalities of the vehicular network but also the intermediate communication or interaction in conditions of its operation under such networks. The operation of Wi-Fi as a provider of amid vehicle communication and processing of WiMAX as a provider of a vehicle to infrastructure communication in VANETs was evaluated. Finally, scenarios with tangency orbits, vehicle accelerates, tangency lengths and points of urbanization were directed.

REFERENCES

1. Barazanchi I Al, Abdulshaheed HR, Shawkat SA, Binti SR. Identification key scheme to enhance network performance in wireless body area network. Period Eng Nat Sci. 2019;7(2):895–906.
2. Sharma B, Sharma MSP, Tomar RS. A Survey: Issues and Challenges of Vehicular Ad Hoc Networks (VANETs). SSRN Electronic Journal [Internet]. Elsevier BV; 2019; Available from: http://dx.doi.org/10.2139/ssrn.3363555
3. Sheikh, Liang, Wang. A Survey of Security Services, Attacks, and Applications for Vehicular Ad Hoc Networks (VANETs). Sensors [Internet]. MDPI AG; 2019 Aug 17;19(16):3589. Available from: http://dx.doi.org/10.3390/s19163589
4. Barazanchi I Al, Shibghatullah AS, Selamat SR. A New Routing Protocols for Reducing Path Loss in Wireless Body Area Network (WBAN). J Telecommun Electron Comput Eng Model. 2017;9(1):1–5.
5. Naderi M, Zargari F, Ghanbari M. Adaptive beacon broadcast in opportunistic routing for VANETs. Ad Hoc Networks [Internet]. Elsevier BV; 2019 Apr;86:119–30. Available from: http://dx.doi.org/10.1016/j.adhoc.2018.11.011.
6. Shibghatullah AS, Barazanchi I Al. An Analysis of the Requirements for Efficient Protocols in WBAN. J Telecommun Electron Comput Eng. 2014;6(2):19–22.
7. Fan N, Wu CQ. On trust models for communication security in vehicular ad-hoc networks. Ad Hoc Networks [Internet]. Elsevier BV; 2019 Jul;90:101740. Available from: http://dx.doi.org/10.1016/j.adhoc.2018.08.010
8. Abdulshaheed HR, Binti SA, Sadiq II. A Review on Smart Solutions Based-On Cloud Computing and Wireless Sensing. Int J Pure Appl Math. 2018;119(18):461–86.
9. Bdulshaheed HR, Yaseen ZT, Al-barazanchi II. New approach for Big Data Analysis using Clustering Algorithms in Information. Jour Adv Res Dyn Control Syst. 2019;2(4):1194–7.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906047 |

10. Saha D, Wararkar P, Patil S. Comprehensive Study and Overview of Vehicular Ad-HOC Networks (VANETs) in Current Scenario with Respect to Realistic Vehicular Environment. International Journal of Computer Applications [Internet]. Foundation of Computer Science; 2019 May 15;178(15):26–40.
11. Abdulshaheed HR, Binti SA, Sadiq II. Proposed a Smart Solutions Based-on Cloud Computing and Wireless Sensing. Int J Pure Appl Math. 2018;119(18):427–49
12. Kadhim AJ, Seno SAH. Energy-efficient multicast routing protocol based on SDN and fog computing for vehicular networks. Ad Hoc Networks [Internet]. Elsevier BV; 2019 Mar;84:6881. Available from: http://dx.doi.org/10.1016/j.adhoc.2018.09.018
13. Rubin I, Baiocchi A, Sunyoto Y, Turcanu I. Traffic management and networking for autonomous vehicular highway systems. Ad Hoc Networks [Internet]. Elsevier BV; 2019 Feb;83:125–48. Available from: http://dx.doi.org/10.1016/j.adhoc.2018.08.018
14. Jabri I, Mekki T, Rachedi A, Ben Jemaa M. Vehicular fog gateways selection on the internet of vehicles: A fuzzy logic with ant colony optimization based approach. Ad Hoc Networks [Internet]. Elsevier BV; 2019 Aug;91:101879. Available from: http://dx.doi.org/10.1016/j.adhoc.2019.101879

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

Scan to save the contact details