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ORIGINAL RESEARCH ARTICLE

Transforming transportation: Embracing the potential of 5G, heterogeneous networks, and software defined networking in intelligent transportation systems

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ABSTRACT

Intelligent transportation systems (ITS) emphasise the significance of vehicle networks. The growing need for services that are safer, more effective, more affordable, infotainment-focused, and sustainable, however, presents difficulties for these networks. To create innovative applications, researchers and businesses are working. Through effectively coordinating vehicle operations, ITS promotes safe driving, efficient traffic flow, and effective route planning. Referring to automobile heterogeneous, autonomous, flexible, and programmable networks is important given the requirement for convergence of technology in communications. For research and network development, new emerging technologies present intriguing gaps. In this paper, we provide an analysis of wireless technology and potential obstacles to delivering vehicle-to-x communication; including linked cars or autonomous vehicles, which that the initial robot to directly impact the everyday Millions of lived individuals. Study investigates the conceptual change in transportation made possible by the incorporation of modern technology into Intelligent Transportation Systems (ITS), including 5G, heterogeneous networks (HN), and Software Defined Networking (SDN). The incorporation of 5G ensures unparalleled velocity and minimal latency, allowing instantaneous communication between automobiles and infrastructure. Vehicles are easily switched between several network technologies due to heterogeneous networks' seamless communication structure. Technology developments generated an important increase in the worldwide ITS market from 2018 to 2025. During the same time, the global market for SDN increased significantly, indicating a rising to need for programmable and dynamic network infrastructures. The simultaneous growth patterns in the SDN and ITS industries between 2018 and 2025 indicate to a general shift in the sector toward more intelligence and connectivity. It is predicted that this development continues for future. We pay particular attention to the SDN used in the 5G architecture and how it affects HN.

Keywords: intelligent transportation systems (ITS); software defined networking (SDN); 5G architecture; heterogeneous networks (HN)

1. Introduction

5G-enabled HetNets have a number of benefits over conventional homogeneous networks. HetNets can effectively use existing spectrum resources, reduce network congestion, and improve service in both urban and rural regions by merging different kinds of cells and access points. While macrocells continue to provide wide-

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area coverage, the placement of small cells in areas with high densities increases capacity and enables localised and targeted connectivity. 5G-enabled The Internet with IoT ecosystem, which connects multiple devices and sensors, may be supported by HetNets. This makes data interchange easy and makes it possible to use many applications in fields like urban planning, farming, medical care, and more[1]. The potential to transform how we interact with networks has become clearer with the introduction of 5G technology. The use of diverse networks (HetNets), which make use of 5G's capabilities to build effective and adaptable communication systems, was one area in particular that shows promise. HetNets combine different wireless access technologies, including Wi-Fi, small cells, and macrocells, to offer seamless connectivity and improve network performance[2].

By isolating the manage layer through a single point of information and centralising system management through a based-on software controller, SDN presents a revolutionary approach to network architecture. SDN offers a more adaptable and flexible framework for managing and coordinating network resources by separating network management from underlying infrastructure. The expanding difficulties facing contemporary transportation networks are addressed in large part by ITS. These systems make use of cutting-edge technologies to improve the sustainability, efficiency, and safety of transportation infrastructure. SDN, among the latest technological advancements, has drawn a lot of interest because of its potential to completely alter how transportation networks are run and controlled[3].

The fusion of modern technology was driving the impending transformation of the transport sector. Intelligent Transportation Systems (ITS) have the potential to be completely transformed by the implementation of 5G, HN of devices, and software-defined networks (SDN), as well as to fundamentally alter how people move around and connect. The fifth-generation wireless technology, known as 5G, offers unprecedented speed, extremely low latency, and huge connection, opening up a wide range of creative applications. It was perfect for mission-critical transportation applications like driverless vehicles, intelligent traffic management, and linked infrastructure due to its high capacity and low latency features, which facilitate real-time communication[4].

HN, which supports 5G, combines macrocells, small cells, and Wi-Fi to build flexible and effective communication networks. HN provides improved coverage, expanded capacity, and improved network performance by merging several access methods. This makes it possible to connect seamlessly in both crowded urban areas and isolated rural places. SDN integration transforms network administration and control, enhancing the potential of ITS even further. SDN enables centralised management and programmability by severing the connection between the control plane and the underlying infrastructure. This enables transportation authorities to control traffic flows dynamically, allocate resources efficiently, and react quickly to changing circumstances[5].

The motivation of this study is to investigate and utilise the capabilities of heterogeneous networks, software-defined networking (SDN), and 5G in ITS. By enabling quicker, more dependable and intelligent interaction among vehicles, facilities and other connected devices, the combination of these innovations has an opportunity to revolutionise transportation systems. The project intends to improve the effectiveness, safety, and overall efficiency of ITS by comprehending and using the possibilities of 5G, network diversity, and SDN are shown in **Figure 1**.

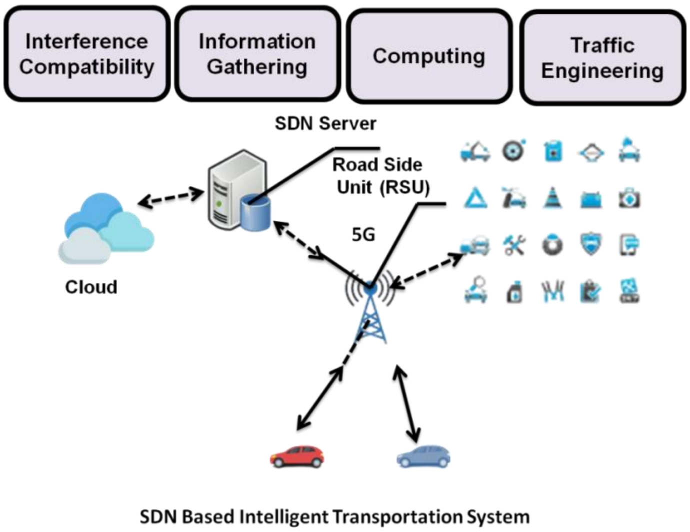

Figure 1. SDN based intelligent transport system.

In this article, the applications and specifications for the next vehicle networks are summarised. In order to evaluate novel paradigms and alternative technologies, it examines the state of vehicular networking as it stands today.

The organisation of this paper are as follows section 2—literature survey, section 3—methodology includes ITS and Smart transportation, Emerging ITS technologies, 5G mobile network and SDN, section 4—Results and concluded with section 5 were demonstrated on this paper.

2. Literature survey

The study of Nkenyereye et al.[6] examined the assessment of software-defined based vehicular network systems by analysing their modelling and implementation approaches. Existing solutions, such as Software-Defined Vehicular Networks (SDVNs), Software-Defined Edge Computing (SDE), Software-Defined Edge Computing using 5G, and SDN-based routing, tackle the issues including the interruption of connection among vehicles and SDN controllers in addition to networking in portable (edge) cloud computing. The study of Gohar and Nencioni[7] primarily examined the effects and ramifications of 5G on ITS from a variety of angles and it examined the innovation and transformation of numerous vertical businesses in a smart town as well as the effect of 5G networks on different scenarios. Additionally, it focuses on how vehicular communication affects the implementation of intelligent transportation systems (ITS) in the setting of smart cities. The study of Rahouti et al.[8] presented a thorough analysis of SDN's fundamental capabilities in regards to safe communication infrastructure at various scales. Realising the goal of a smart city presents a tremendous challenge in terms of distributing and processing the enormous volume of data in a secure and effective manner. To overcome the issues, it notably highlights security risks and difficulties in SDN plane-based designs for applications that support smart cities. The paper of Wu et al.[9] presented a comprehensive examination and evaluation of network breaking control in a variety of cases along with the particular IIoT services like smart factories, smart energy, and smart transportation. They additionally emphasize the benefits and drawbacks found in numerous previous works while surveys as well as the present survey in terms of a number with significant criteria.

The study of Abayagunawardhana et al.[10] predicted the efficiency of system performances by developing a computing method to develop reaction time of the SDN-based data traffic offloading system (SDN-TOS). A mobile communications provider set the values associated with the Mininet emulation process, which were gathered with a third-party broker situated in Sri Lanka. To undertake the comparison between the Cloud Service Providers (CSP) method and the recommended model, additional analysis is taken into the consideration.

The paper of Iqbal et al.[11] offered a thorough analysis of IoT network dangers, security requirements, difficulties, and attack routes. It suggested a unique paradigm based on a gap analysis that blends software-defined networking (SDN) with network-based implementation of IoT architecture. The article emphasises fundamental challenges as significant barriers to bringing IoT stakeholders together on one platform. Additionally, it highlights research results that highlight the necessity of a network-based safety measure in the context of IoT.

The study of Wang et al.[12] introduced the BHTE, a 5G-ITS heterogeneous Crypto currency based Hierarchical Trust Evaluation approach. The tactic assesses task distributors and ITS users' trust using federated deep learning technology. Furthermore, hierarchical incentive structures are created to make sure that rewards and penalties are acceptable and equitable. In the paper of Xia et al.[13], DDQN was suggested as a QoS optimisation technique for software-defined industrial heterogeneous networks to solve the issues of difficult to meet the QoS demands of multiple sources stream data in Industrial system with code specified that are heterogeneous, which causes link bottlenecks and inefficient use of network resources. In the HN, the best routes for multi-source data flows are chosen using the DDQN algorithm. The software-defined network (SDN) controller consistently chooses these best routes. The article of Mahmood et al.[14] examined security assaults on automotive networks, emphasising the requirement for trust management as a substitute for conventional cryptography-based security measures. The management of trust assures dependability, validity, and relevancy by addressing both selfish and malignant nodes. Currently, these ideas was just beginning to take shape. In order to increase efficiency, essential enabling technologies like cloud computing, HetNet, D2D Communication, and SDN were presented in the article of Kumhar M and Bhatia J.[15].

The state of the art for cellular connectivity technologies and IoT application needs was evaluated. It includes a comparison of communication methods and newly developed IoT applications. A case investigation on the Internet of Things (5G) was also presented. In a dynamic and scattered vehicular networking environment, managing network resources was a difficult problem, to overcome these issues the article of Mahmood A.[16] aimed to ensure exceptionally dependable and low-latency interaction for the safety-critical vehicular collaborative applications and services, in a dynamic and scattered vehicular networking environment, managing network resources was a difficult problem. The paper discussed ongoing research on software defined heterogeneous vehicular networking architecture. The study of Din et al.[17] presented a novel SDN idea for ITS improvement. Sensing relays and core network were the three layers that make up the suggested architecture. The recommended architecture was based on 5G and SDN. It aimed to maintain constant connectivity between cars and an SDN controller. It makes use of SDN features to make programmable capabilities continuously accessible and flexible. The goal of the study of Yu[18] was looked into how 5G technology was being used in smart city road networks to build and improve the predictive skills of intelligent transportation systems. Additionally, it emphasises boosting smart cities' intelligence. The research suggested adopting 5G heterogeneous networks for actual time capacity load balancing scheduling in light of the numerous.

In the research of Su et al.[19], a brand-new content distribution system for heterogeneous networks (HetNets) that includes Internet of Connected Vehicles (IoCVs) and Unmanned Aerial Vehicles (UAVs) was presented. To improve the Quality of Experience (QoE) for vehicle users, a proposed mechanism was being put forth. It presents a cutting-edge framework for the distribution of content to UAVs and IoCVs. The study of Raza et al.[20] suggested a Social V2X Communication Model that uses integrated cellular 5G technology to improve traffic effectiveness for ITS. In V2X communication, the model combines social behaviour and offers automatic information and surveillance. It aspired to timely supply a critical collection of data with extremely high speed and low delay, enabling the activation of essential activities in a single networking environment.

To fully utilise the capabilities of cutting-edge connectivity, data analytics, and automation for improving transportation efficiency, safety, and sustainability, the role of 5G technologies in ITS within smart cities needs to be researched and understood.

The study of Marappan et al.[21] suggested a novel evolutionary modelling approach that combines an energy-efficient clustered routing technique with genetic algorithms to address the pressing problem in hospital healthcare networks. To reduce the amount of energy consumed overall in wireless sensor healthcare applications creates a new method of diverse network structures by combining the original energy consumption model with new evolutionary modelling.

The paper of Muruganandam et al.[22] used computational methods, including adaptive employees, to pinpoint the exact cluster that needed to be optimized for power consumption. The structure of energy use generates the framework. The new effective evolutionary operators were evaluated throughout the optimization process for a lifetime. The recommended method was used to simulate numerous network types and gateway parameter settings.

The study of Lyu K and Li J.[23] examined the gradient descent technique was implicitly regularized in homogeneous neural networks, such as fully-connected and convolutional neural networks (CNN) that include ReLU or LeakyReLU activations. In comparison to prior findings for homogeneous smooth neural networks, these results give more quantitative convergence results with fewer assumptions and expand the earlier findings for logistic regression with one-layer or multi-layer linear networks.

The paper of Cohen et al.[24] provided a broad theory of Group equivariant Convolutional Neural Nets (G-CNNs) on homogeneous spaces, including the sphere and Euclidean space. These networks use feature maps to store field on a homogeneous basis space, and layers, which were equivariant mappings between field spaces.

The study of Tulin et al.[25] investigated the relationship between the network composition of various social groups and the neighbourhood composition as well as individual choice. Their prediction was that organizations with higher levels of local engagement and resource management would have more homogeneous networks than predicted based on the demographics of the area.

3. Methodology

3.1. ITS and smart transportation

Utilizing the Intelligent Transportation Systems (ITS) infrastructure, driverless vehicles will become the main form of transportation, according to a forecast from Gartner. In the future Internet of Things, connected cars that can access the Internet will be essential. For connected vehicle applications, a novel structure fusing environment/energy, mobility, and safety is required to support these improvements. Larger smart cities will have these networked transportation systems, allowing for smooth communication between key smart city infrastructures and ITS components. Intelligent transportation attempts to enhance mobility, long-term viability and the urban/suburban economy via driver- and user-specific automobile leadership, control of traffic, transit, and administration of infrastructure. Around the world, many designs and protocols have been developed and put into use, especially in the Japan, USA, and Europe. The creation about Smart Cities, where contextual data enables full data mapping for citizens, businesses, and their mobility demands, is the ultimate goal of ITS. These developments are made possible by 5G technology, which also encourages study into interference control. The management of the heterogeneity and diversity of services in future networks requires flexibility and architectural adaptability, which are made possible by technologies like cloud computing, Big Data, SDN, Network Functions Virtualization, and edge computing. **Figure 2** shows the System architecture for ITS and Smart transportation.

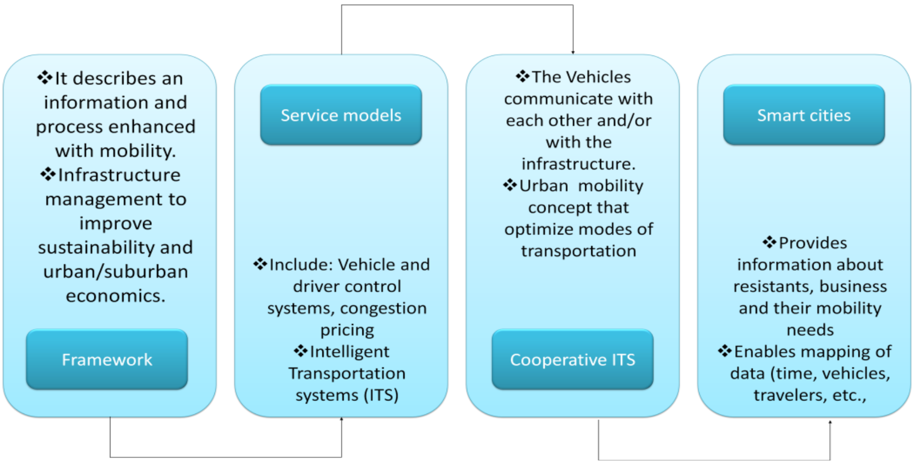

Figure 2. System architecture.

3.2. Emerging ITS technologies

The integrated Next-Generation Network (NGN) with complete connection and functionality is envisioned for the hyperconnected world of the future. It's a network based on packets that offers telecom services and makes use of a number of high-speed, QoS-compatible transport technologies. The network can handle many types of traffic and is independent of the underlying transport technologies. Networks that can be programmed and automated are required by the environment. In the late 1990s, vehicle ad hoc networking emerged as a difficult wireless network environment. Wireless networking became more and more common. The SDN, ITS and the 5G architecture are both included in the concept for vehicle networks are shown in Algorithm 1.

Algorithm 1 ITS-SDN

Initiate the ITS elements:
Describe Vehicles
Create a Communications Network
Start the SDN Controller
Initializing of SDN Controllers:
Access to network resources
Establish the basic network settings and rules
Vehicle Initialization:
Enroll in the SDN Controller
Assemble the first route data
Main Loop:
while (system_running):
Obtain information from automobiles:
Vehicle Identification Number
Present Location
Traffic Circumstances
Examine Traffic Information:
Analyze the degree of traffic
Determine probable traffic accidents
SDN Controller Decision Making:
Adapt network settings in light of traffic analysis
Use SDN rules to optimize traffic flow

Algorithm 1 (*Continued*)

```
    Update Vehicles:
        Send cars the best routes
Dispense with traffic updates in real time
    Handle Incidents:
        Recognize and address traffic situations
        Adaptively redirect impacted vehicles
    Data Logging:
Analyze logs of events, traffic statistics, and SDN controller choices
SDN Controller Shutdown:
  Turn off your network devices
  Save the final configuration setting
Vehicle Shutdown:
  Disengage from the SDN Controller
End ITS
```

3.3. 5G mobile network

3.3.1. 5G mobile network design

The IEEE 802.11ac standard provides the foundation for the 5G wireless broadband technology. It offers wirelessly area networks or wide area networks for high-speed Internet and data services. Although 5G is not expected to be live until 2020, some producers are already including aspects of the new standard in their goods. As shown in **Figure 3**, 5G has several benefits in a variety of domains and has particular applications in some industries.

3.3.2. Requirements

Next-generation networks' architecture must be adaptable in order to effectively support a wide variety of use cases. Functionality and efficiency requirements for network equipment and systems are raised by IoT traffic and V2X connectivity. Specifically, V2V communication demands a significant decrease in latency, with an end-to-end delay of only 5 ms being the goal. Even in circumstances in which gadgets lack network connectivity due to coverage gaps, reliable V2V services are crucial. Backward compatibility is also essential because the 5G architecture needs to cohabit with existing systems. Applications of the future will develop in a multiplatform setting. **Figure 3** depicted the 5G applications in various domain.

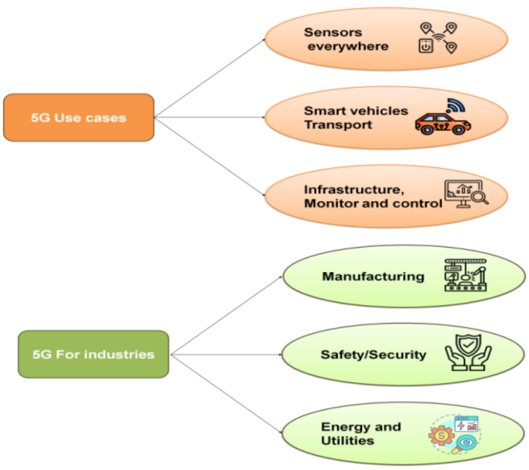

Figure 3. 5G application.

3.3.3. 5G infrastructure market range at global level

The market for 5G infrastructure is expected to increase significantly and is now seeing tremendous expansion. By providing unheard-of speeds, capacities, and low latency, 5G networks are revolutionising the telecoms sector and opening up a wide range of cutting-edge services and applications. Several market research publications have produced estimates for the market size of 5G infrastructure. With the help of revolutionary technologies like self-driving cars, remote surgery, virtual reality, and Internet of Things applications, the implementation of 5G infrastructure is anticipated to assist an array of sectors include healthcare, transportation, manufacturing, entertainment, and smart cities. 5G infrastructure market range at global level from 2021–2030 as shown in **Figure 4** and **Table 1**.

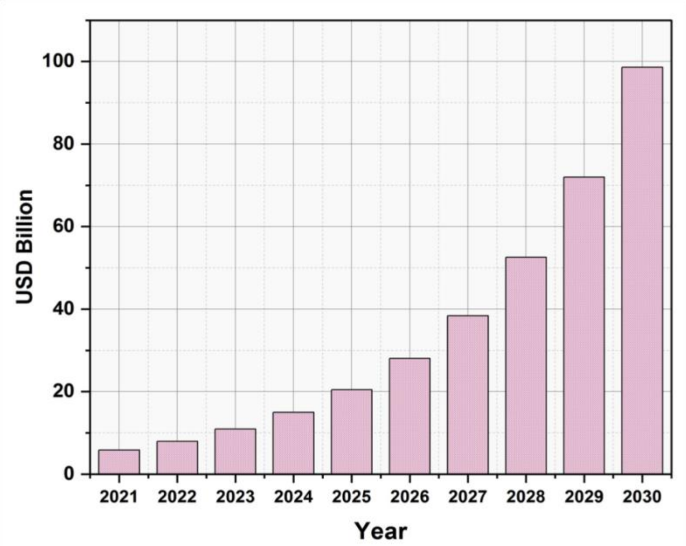

Figure 4. 5G infrastructure market range from 2021–2030.

Table 1. 5G market from 2021–2030.

Year	USD Billion
2021	5.82
2022	7.97
2023	10.91
2024	14.95
2025	20.47
2026	28.03
2027	38.38
2028	52.56
2029	71.98
2030	98.57

3.4. SDN

Future network trends like Software-Defined Networking (SDN) make it possible to programme networks dynamically. It lowers costs, speeds up provisioning, centralises management, encourages creativity, and provides for programmability. By centralised and programmatically managing the network stack, SDN gives networks intelligence and flexibility. It enables software-controlled control of packet handling operations and control plane operations, allowing for the easy installation of new services while maintaining compatibility with legacy protocols. Data centres are transformed to larger and automated resources thanks to SDN, which offers an evolving and software-controlled solution to network administration. Through a layer of software that virtualizes and isolates networks from its underlying physical infrastructure, the processing of packets is no more dependent on fixed configuration files with SDN. Instead, it is organised dynamically. The distinctions between conventional and SDN networks are shown in **Figure 5**.

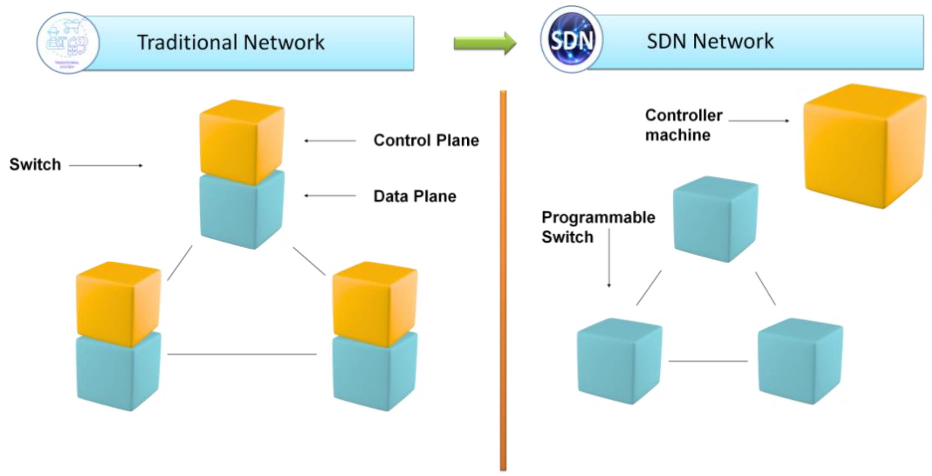

Figure 5. Traditional and SDN networks.

SDN based management of 5G network

SDN (Software-Defined Networking) offers network management flexibility by separating the control plane and data plane, enabling software-based traffic handling. The control plane, typically managed by a centralized unit called the SDN controller, plays a crucial role in network performance. Various SDN control plane architectures, including centralized, distributed, and LC-PD (Locality and Policy-Driven) architectures, are emulated in Mininet-WIFI. The Implementation of a centralised control plane design as shown in the **Figure 6**.

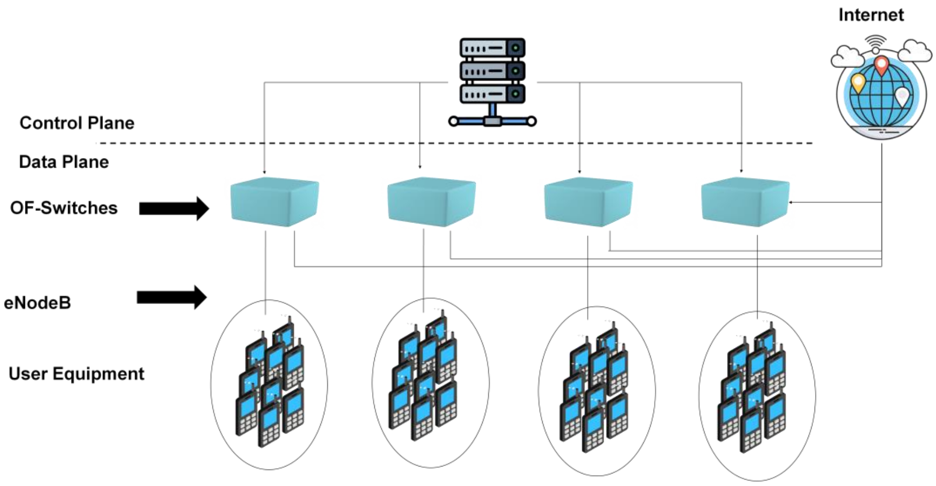

Figure 6. Implementation of a centralised control plane design.

4. Findings

Researchers, decision-makers, and industry stakeholders can benefit greatly from the findings of this paper in understanding how wireless technologies, SDN, and heterogeneous networks contribute to effective ITS. These results can serve as a roadmap for future research in the field, opening the door for the effective use of CAVs and their beneficial effects on the everyday activities. Within the context of ITS, we investigated the integration of heterogeneous networks. Our research shows how crucial it is to combine various wireless technologies, including cellular networks, Wi-Fi, and 5G, in order to build a solid and dependable communication infrastructure. For ITS applications, higher coverage, better bandwidth distribution, and improved connection are made possible through the integration of HN. The ITS is a highly developed software created to offer cutting-edge features associated with different modes of travel and traffic control. Additionally, it enables users to utilize public transportation in a more secure, more organized, and intelligent manner by enabling them to make better informed choices[26].

The transportation industry comprehensive adoption and utilization of modern technology is demonstrated by the ITS market's spectacular rise between 2018 and 2025. In accordance with the growing requirement for evolving, and the programmable network infrastructures in worldwide, the SDN industry observed the significant growth at the same time. The combined growth trajectory of the ITS and SDN markets between 2018 and 2025 represents a paradigm change in the transportation sector toward intelligent, technologically advanced solutions, indicating further progress in the years following.

4.1. Global market size for intelligent transportation system

Global transport networks have significantly improved and advanced as a result of the adoption of an intelligent transport system (ITS). Modern technology and data-driven solutions have enabled this integrated system, which has completely changed the way people and products are transported across various forms of transportation. The improvement of general road safety is one important result of the worldwide ITS. Vehicles can exchange real-time information with the transportation infrastructure and other vehicles through the integration of sensors, cameras, and communication systems, enabling proactive steps to avoid accidents and ease traffic. Intelligent traffic management systems optimise vehicle flow and reduce delays by dynamically modifying traffic signals and vehicle routing based on the flow of oncoming traffic. **Figure 7** and **Table 2** indicates the Global ITS market size from 2018–2025.

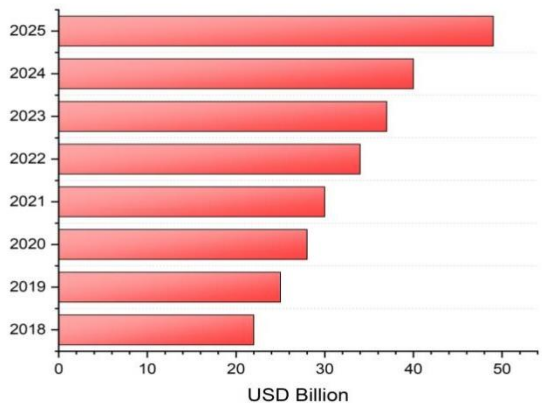

Figure 7. Global ITS market size (2018–2025).

Table 2. Global ITS market size.

Year	USD Billion
2018	22
2019	25
2020	28
2021	30
2022	34
2023	37
2024	40
2025	49

The worldwide ITS has also had a significant impact on sustainability and efficiency. Smart traffic management algorithms optimise travel times and schedules while lowering pollutants and fuel use. A cleaner and more sustainable transport system has also benefited from the incorporation of electric and autonomous cars into the ITS framework. Intelligent distribution of electric vehicle charging infrastructure throughout urban areas ensures easy access for EV users and encourages the use of renewable energy sources.

Developing industries like cloud services, cloud services, IoT traffic, vehicle-to-X (V2X) traffic, and Machine Type Communication (MTC), x are anticipated to benefit from new services made possible by next-generation telecommunications networks. The growing demand for connection and data sharing across numerous industries will be supported by these developments. This is illustrated in **Figure 8** as a graphic manner.

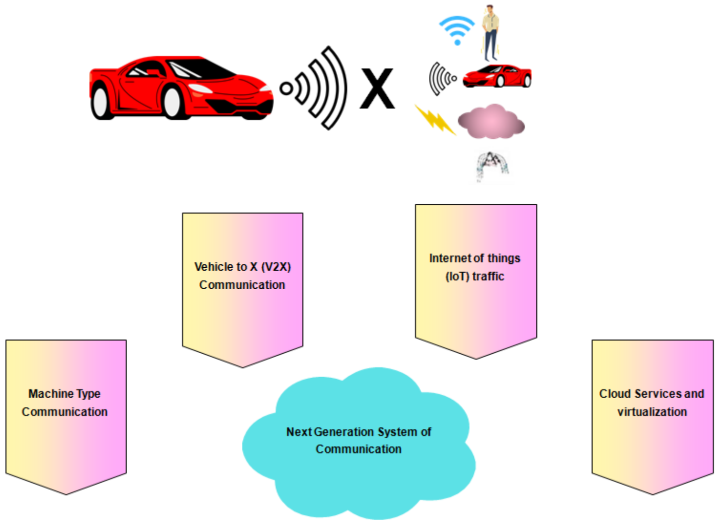

Figure 8. V2X communication.

4.2. Software defined networking for heterogeneous networks and 5G

This study investigates the application of Software-Defined Networking (SDN) in contexts with heterogeneous networking. It shows examples of applications where SDN is a crucial enabler, like resource sharing in mixed networked settings and the creation of a software-defined design termed Soft Air for 5G mobile networks. The study also offers an intelligent solution for 5G HN dynamic networking that blends SDN with awareness and adaptability. Performance analysis confirms the usefulness and adaptability of the suggested solutions for addressing 5G network dynamics. While there are efforts to create architecture for diverse networks, SDN-based exploration is still in its early phases with surveys, suggestions, and frameworks being created. Large-scale heterogeneous connectivity and the 5G paradigm are two ongoing trends in research across the globe.

4.2.1. SDN market size at global level

According to a Grand View Research analysis, the worldwide SDN industry would likely exceed $70 billion by 2025. From 2020 to 2025, according to a different MarketsandMarkets analysis, the SDN market was expected to expand at a compound yearly rate of growth of over 31%, achieving a value for around $29 billion.

These projections show that SDN technologies are being more widely used in a variety of sectors, including telecommunications, data centres, cloud services, and corporate networks. Global demand for SDN is being driven by advantages including increased system flexibility, scalability, and centralised network management. SDN market size at global level from 2018 to 2025 as shown in **Figure 9**. SDN market range at global level (2018–2025) are in **Figure 9** and **Table 3**.

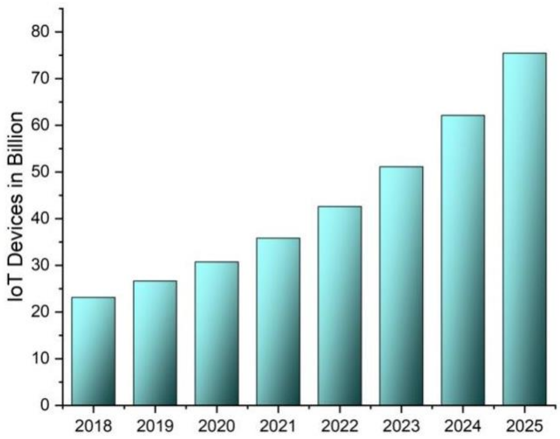

Figure 9. SDN market size from (2018–2025).

Table 3. SDN market at global level (2018–2025).

Year	USD in Billion
2018	23.14
2019	26.66
2020	30.73
2021	35.82
2022	42.62
2023	51.11
2024	62.12
2025	75.44

4.2.2. Further developments for the suggested model

To minimize complexity and solve the issue that is effectively and efficiently possible to leading a streamlined procedure that minimizes the overall complexity and guarantees that it is solved in the shortest amount of time. This method is intended to improve the resource and computational efficiency, with leading to a faster and more economical solution[27,28].

5. Conclusions

Currently going through a transformational phase, vehicular networks have the potential to be integrated into the ubiquitous computing connected environment. The literature places a strong emphasis on combining established and new technologies to provide heterogeneous solutions. Manage linked automobiles and the Internet of Things (IoT) using paradigms including adaptable systems, SDN, and NFV. Implementing 5G and SDN may solve issues with scalability, dependability, dependability, and latency. To improve global mobility, smart transportation systems make use of information, applications, infrastructure, and technology. The Next Generation wireless technology known as 5G promises more connectivity and higher internet rates, opening the door to configurable network architectures for Smart Cities and vehicle networking. The possibilities of wireless technology for 5G in transportation and its numerous use cases are outlined in this article.

The exact meaning of 5G mobile networks is still up for debate amongst researchers and business professionals, but the networks and standards are constantly changing. The requirement for integration between modes of transport and industrial processes, which necessitate distant functioning, control, manipulation, and monitoring, is also driving the evolution of communication networks.

This paper’s future work should concentrate on carrying out in-depth investigations and tests to thoroughly investigate the possible uses of 5G, network heterogeneity, and SDN in intelligent modes of transportation. By tackling these issues, we can open up new possibilities for improving the sustainability, safety, and efficiency of transportation in smart cities.

Author contributions

Conceptualization, SKG and AKP; methodology, SKG; software, SS; validation, RRC, RK and UK; formal analysis, PS; investigation, SKG; resources, SS; data curation, RRC; writing—original draft preparation, SKG; writing—review and editing, AKP; visualization, SS, RRC; supervision, RK; project administration, SKG. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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