			the algorithm's efficacy and the RIS's capability to augment V2I capacity.	and optimization.
Ju et al. [12]	2023	A multi-agent deep reinforcement learning approach is used for joint secure offloading and resource allocation for a vehicular edge computing network.	The author introduced a deep reinforcement learning-based SORA method designed for the joint optimization of secure offloading and resource allocation, utilizing physical layer security (PLS) in conjunction with a spectrum sharing system.	The proposed model demonstrates accuracy and efficiency, focusing on time-constrained resource scheduling to mitigate misuse and improve performance.
Cui et al. [13]	2022	Based on Consortium Blockchain, sharing data between vehicles is safe and quick	The author developed a consortium blockchain to facilitate transparent and anonymous vehicle-to-vehicle data transfer. 5G and blockchain technology facilitate data exchange, which happens independently of the transfer of restricted stock units.	The centralized architecture of a consortium increases the likelihood of rule violations by malicious users within the network. As the number of users increases, the process of upgrading becomes more complex, necessitating approval from all users involved.
Chen et al. [14]	2021	Spectrum sharing based on quality of service for reconfigurable intelligent surfaces (RISs) helped vehicle networks.	The author used global CSI for V2I and V2V communications in RIS-enhanced vehicular networks because real-time CSI was hard to use in V2X channels that changed quickly.	Resource detection and allocation time hinders network performance, and intelligent surface spectrum sharing raises energy consumption.
Guo et al. [15]	2022	Full-Duplex Vehicle-to-Infrastructure (V2I) Communications Require Joint Resource Allocation and Power Control in High-Density Networks	The author introduced a Dual Graph Coloring-based Interference Management (DGCIM) technique to tackle this intricate problem.	The proposed joint resource allocation model identifies collisions in the network that increases loss rate.

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Using a fleet of vehicles with varied levels of automation as a case study, Wang et al. [18] investigated the field of conflict analysis. The two main types of cooperation made possible by V2X communication are status-sharing and intent-sharing. Intent sharing allows cars to communicate about their planned future movements, including things like top speeds and acceleration limits, in addition to status sharing, which allows them to communicate about their current states, including speed and location. In this research, Wang et al. [19] provided a foundation for conflict analysis and demonstrated how it may be utilized to enhance the decision-making of vehicles operating with varied degrees of automation and collaboration. The author focused on scenarios in which cars can exchange data about their locations, speeds, and intentions with one another via V2X communication technology. Table 5 represents the Traditional Model Working and Limitations.

Table 5. Traditional Model Working and Limitations

Author Name	Year of Publication	Manuscript Title	Proposed Model	Limitations
Bute et al. [16]	2023	Distributing Cellular and V2V Content with QoS Consciousness Using a Fusion of Social and Physical Attributes	The author proposed a demographic and geographic-based content distribution method. V2V users pair based on shared interests and connection reliability, while V2N users' QoS is considered uplink and downlink.	The list of attributes considered are less that can be extended by considering the internal and external factors to improve the quality of service levels.
Zhang et al. [17]	2021	A Protocol for Distributing Data Utilizing Unmanned Aerial Vehicles, Featuring Anticipatory File Sharing and Caching in V2X Networks	The author designed a model to increase the efficacy of data distribution by introducing a unique scheduling system for file sharing and proactive caching in V2X networks that is facilitated by UAVs	The file sharing model consumes more time and the delay levels are also high. The delay levels results in performance degradation that need to be improved.
Wang et al. [18]	2023	Multi-vehicle conflict resolution with delayed status and intent updates	The author investigated the field of conflict analysis. The two main types of cooperation made possible by V2X communication are status-sharing and intent-sharing.	The vehicle location detection and the parameters for the detection need to be updated for reducing the conflicts and also information sharing need to be updated to perform in less time.
Wang et al. [19]	2023	Analysis of Potential Conflicts in Cooperative Maneuvers That Use V2X Communication to Disclose Status and Goals	The author provided a foundation for conflict analysis and demonstrated how it may be utilized to enhance the decision-making of vehicles operating with varied degrees of automation and collaboration	The security levels of the intent sharing is less as the number of attacks is high and there need to be a better attack management model to improve the security levels.
Zhao et al. [20]	2023	Allocating Resources Efficiently in SCMA-V2X Networks With Random Multiple Access	The author proposed SCMA-orientated RMA-based V2X resource allocation. This study examines SCMA-based RMA for V2I and V2V users. choose codebooks from a shared pool for transmission on.	The proposed model is suggested to use hybrid deep learning and optimization models for better resource allocation. The cluster generation process helps in detection

With this study, Zhao et al. [20] provided a method for resource allocation in V2X networks that fully takes advantage of the SCMA-oriented RMA used by these systems. In this study, the author investigated an SCMA based on random multiple access (RMA), wherein users of both V2I and V2V choose codebooks from a shared pool for transmission. The full bandwidth is divided in half for V2I transmission and half for V2V transmission to prevent user interference. To maximize throughput for all V2I users while satisfying the reliability needs of V2V users, we devised a problem that involves maximizing both the selection of users to receive codebooks and the allocation of available bandwidth. There is no easy answer to this problem since it is a mixed-integer programming (MIP) problem with a probabilistic constraint.

A simulation-based experimental framework is delineated below to validate the proposed resource allocation methods and assess their efficacy.

• ***Tools and Environment:*** Use MATLAB or NS-3 in conjunction with SUMO (Simulation of Urban Mobility) to simulate vehicular dynamics and network interactions

. • ***Simulation Parameters:***

The network type is a 6G-enabled V2X network that uses DSRC and LTE-V2X communication protocols. The traffic environment is urban, characterized by fluctuating vehicle densities ranging from 10 to 100 vehicles per kilometre.

Evaluation Metrics: Latency, throughput, packet delivery ratio, and fairness index.

• Proposed Framework:

1. Establish a foundational resource allocation model using deep reinforcement learning (DRL).
2. Create a model for resource allocation based on PFA.
3. Assess both models under uniform conditions to evaluate performance.

• ***Results and Analysis:*** The simulation will evaluate latency, throughput, and fairness. PFA is anticipated to perform exceptionally well in situations demanding high fairness while maintaining throughput, especially in dense networks.

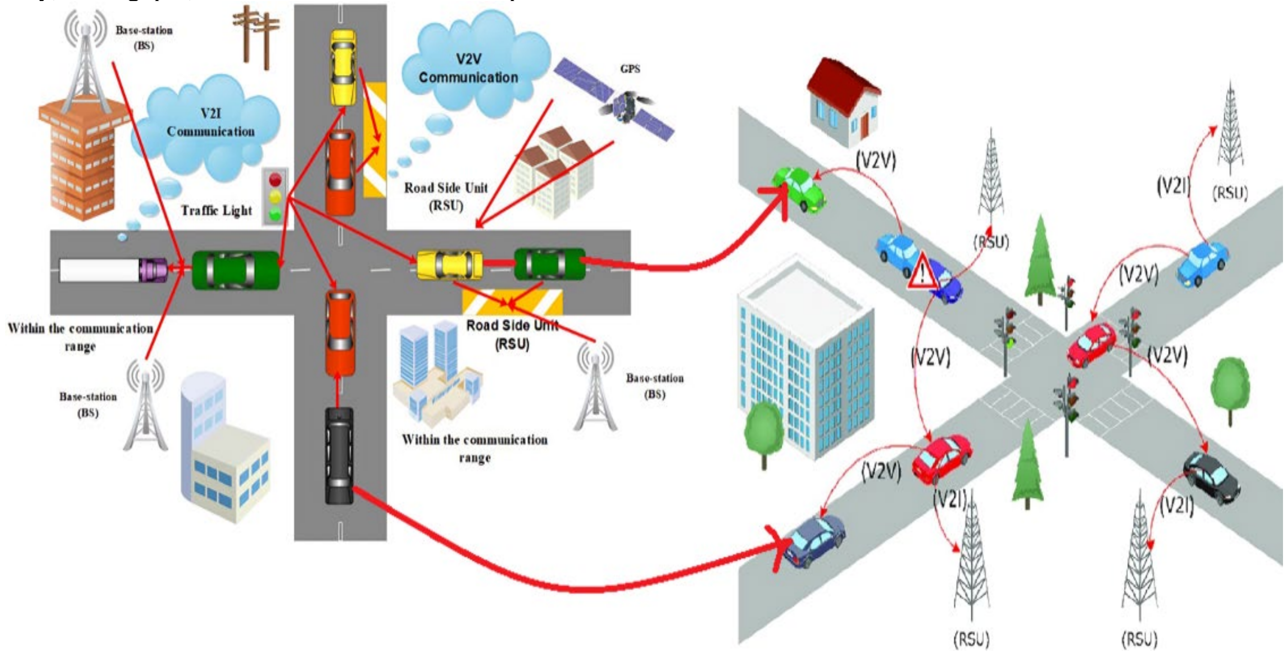

Figure 2. Block Diagram Illustrating the Interaction Between Vehicles, Roadside Units (RSUs), and the Base Station in the Proposed V2X Communication Framework

3.Discussion

The 6G network could have many applications, but no concrete standards or specifications have been set as of yet. Some people believe that 6G networks should go beyond just being 5G networks with more capacity [26]. The 5G network may have its limitations, but coverage should not be restricted to the ground. The 6G network will also have greatly enhanced Artificial Intelligence (AI). AI is seen by many professionals in the area as a key driver and enabler of the development of the 6G network [27]. Unfortunately, there is still a long way to go before 5G networks can deliver fully autonomous, everything-as-a-service, and really immersive services. The 5G communication system will be a step up from the current systems, but it won't be enough to enable completely automated and intelligent ideas in the next decade. New features and improved reliability in communications are just the beginning for the 5G network. New aspects of 5G technology include licensed and unlicensed channel coexistence, enhanced spectrum management, and expanded frequency ranges [28]. Improved air interfaces, resource allocation [29], decision making, and computation are just some of the cutting-edge technologies that 6G will need to implement to reach its lofty promises. Support from UAVs and low earth orbit satellites [30] may help V2X systems improve communication quality in areas where traditional terrestrial communication systems may have blind spots. Air interfaces, resource allocation, decision making, and computing will all need to be made more reliable and efficient for 6G. As shown in Figure 2, a typical 6G-V2X system integrates multiple types of vehicle communication to pave the way for a wide range of promising future applications.

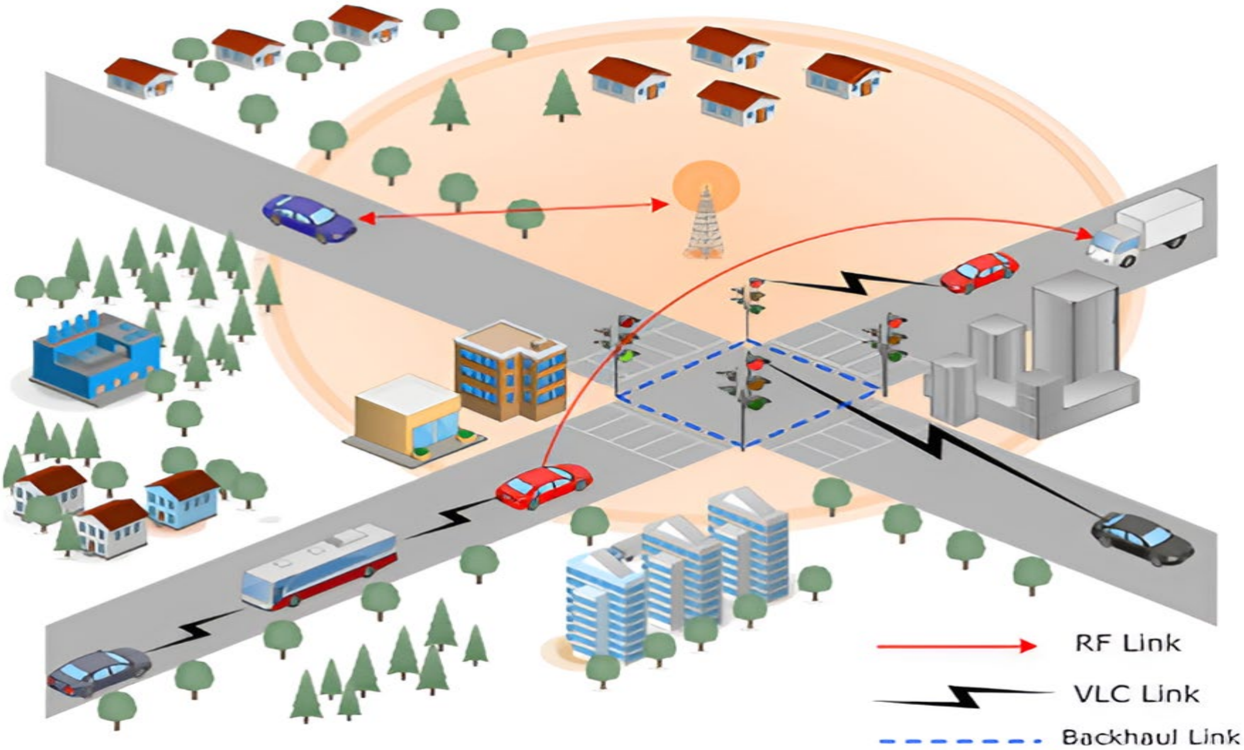

Figure 3. 6G V2X System [29]

Implementation Potential and Deployment Challenges: Vehicle-to-Everything (V2X) systems that are enabled by 6G hold a lot of promise for smart transportation systems, but they need to solve some important social, economic, technological, and infrastructure problems first. Socioeconomic factors encompass the cost of advanced infrastructure and hardware, which may present financial obstacles for low-income areas, as well as the necessity for public confidence in autonomous technologies, data privacy, and safety through educational initiatives. Moreover, revised regulatory frameworks for spectrum allocation, data sharing, and vehicle certification are crucial for worldwide implementation. In the world of technology, getting ultra-reliable low-latency communication (URLLC) for safety-critical applications like collision avoidance is still a big problem. Proportional Fairness Algorithms (PFA) and advanced machine learning techniques have been suggested as possible solutions. Ensuring data security and privacy via blockchain technology and tackling scalability challenges in densely populated urban networks through resource-efficient strategies and reconfigurable intelligent surfaces (RIS) are essential. Infrastructure enhancements, including the shift from 5G to 6G and the incorporation of V2X systems within smart city frameworks, encompassing IoT devices and urban traffic management, are essential for optimal functionality. Non-terrestrial networks, encompassing UAVs and satellites, will be essential in mitigating connectivity deficiencies in remote regions. Deployment plans need to include a step-by-step process that starts in densely populated cities and includes collaboration between automakers, telecom companies, and government agencies, as well as pilot tests in the real world to make these systems better on a smaller scale. Effectively addressing these challenges will facilitate the development of scalable, efficient, and secure 6G-enabled V2X networks.

Table 6. Conceptual Model vs. Existing Surveys: A Comparative Analysis

Feature	Existing Surveys	Proposed Survey
Focus on 6G Integration	Limited	Details analysis of 6G-specific features
Resource Allocation Methods	Discussed but not deeply analysed	In-depth evaluation, including PFA
Enabling Technologies	General overview	Detailed insights on ML,blockchain, and RIS
Challenges and Limitations	Surface-level exploration	Comprehensive identification and solutions

Proportional Fairness in Resource Allocation

Resource allocation presents a significant challenge in V2X and V2V communication networks, necessitating a balance among throughput, latency, and equity among numerous vehicles. The Proportional Fairness Algorithm (PFA) has proven to be an efficient approach for attaining this equilibrium. The PFA functions by optimizing the logarithmic aggregate of users' data rates, preventing any individual vehicle from monopolizing network resources while maintaining elevated overall throughput. This is especially pertinent in congested traffic conditions where resource competition escalates. PFA can adjust resource allocation dynamically according to real-time network conditions, accommodating fluctuations in vehicular speed, density, and communication needs. Compared to current methods like Deep Reinforcement Learning (DRL) approaches or static heuristic models, PFA provides a computationally efficient and mathematically sound framework. Its integration with enabling technologies such as machine learning could further augment its performance by forecasting network congestion and proactively reallocating resources.

V2X has garnered a lot of attention as a key enabler of ITS. Improved road safety, more efficient traffic flow, and the ability to meet infotainment needs are all made possible via V2X connections. V2V, Vehicle-to-Pedestrian (V2P), V2I, and Vehicle-to-Network (V2N) communications are all part of V2X. One possible feature of these interactions is their proximity-based nature, which necessitates coordination between neighbouring cars and other equipment. Ad hoc communications using the 802.11p standard are the first established option for V2X communications. The lack of centralized management is a weakness of this standard, which makes it difficult to ensure requirements for security applications. In the future era of connected self-driving vehicles, there will be a diverse range of transportation scenarios and practical applications, incorporating numerous advanced technologies. In order to realize this ambitious vision, it is necessary to establish a V2X communication network that possesses advanced intelligence and the ability to provide extremely quick, highly dependable, and low-delay transfer of substantial volumes of data. The forthcoming requirements of the next-generation V2X will likely be fulfilled by the 6G communication technology. To enhance the quality of service in the network and address the restrictions indicated in the survey, it is necessary to implement an intelligent routing model and efficient resource sharing models. V2V and V2X communications depend on specialised protocols to enable efficient data exchange among vehicles, infrastructure, and other network elements. The manuscript has been augmented to include additional details on essential communication technologies. Dedicated Short-Range Communications (DSRC) is a wireless standard derived from IEEE 802.11p that functions within the 5.9 GHz spectrum and is used for safety applications, including collision warnings and emergency braking notifications. Cellular Vehicle-to-Everything (C-V2X) is a cellular communication technology (LTE-V2X and 5G-V2X) that provides an extended communication range and facilitates both direct (V2V) and network-based (V2N) communication. Hybrid approaches combine DSRC and C-V2X to enhance reliability and minimise latency across diverse network conditions. The manuscript elucidates the protocols governing vehicle interactions with one another and with infrastructure in practical applications. The network architecture of V2X communication is essential in dictating the transmission and processing of data. The manuscript now encompasses descriptions of three principal architectures. Centralised architecture manages data through a cloud or base station. This makes it good for keeping an eye on a lot of traffic, but it can be slow because it relies on the cloud. Decentralised (Ad-Hoc) Architecture makes it easier for vehicles to talk to each other and to infrastructure (V2I), which reduces reliance on cloud infrastructure and boosts real-time responsiveness, especially in safety-critical tasks like avoiding collisions. A hybrid architecture takes the best parts of both models and combines them in the best way possible. It lets vehicles switch between direct and cloud-based communication based on the state of the network, which makes it perfect for 5G-enabled V2X with edge computing integration. These details elucidate how V2X networks effectively oversee resource allocation and data transmission. To improve clarity, the manuscript now incorporates practical applications illustrating the advantages of V2X and V2V technologies in transportation. Collision Avoidance facilitates the exchange of real-time data between vehicles to avert accidents, providing immediate notifications for abrupt braking. Traffic signal optimisation enhances vehicular flow by enabling communication between vehicles and intelligent traffic lights, thereby minimising superfluous stops. Platooning improves fuel efficiency and mitigates congestion by synchronising the movements of closely travelling vehicles, particularly in autonomous trucking. Emergency vehicle priority facilitates preferential passage for ambulances and fire trucks through the modification of traffic signals. Smart City Integration uses V2X data for instantaneous traffic surveillance and emissions regulation. By integrating these applications, the manuscript offers an in-depth comprehension of V2X/V2V communication, emphasising its practical importance in enhancing road safety and traffic efficiency.

4.Conclusion

Researchers are focusing on 6G networks, which offer better services than previous generations, as 5G network research and deployment nears completion. Each new version of communication technology introduces exciting new features. Interest in vehicle-to-extensive network (V2X) connections has skyrocketed as internet-connected, self-driving cars become the norm in smart cities. In order to demonstrate the benefits of 6G-V2X networks over 5G, this overview investigates important enabling technologies and new features of these networks. It provides an update on the latest developments in intelligent transportation system applications of machine learning for 6G vehicle networks. We cover the most recent successes, major obstacles, and potential future opportunities for each enabling technology. There are concerns regarding the security and confidentiality of real-time data due to the fact that future V2X vehicles are anticipated to produce more than 1 terabyte of traffic data per round. There are a lot of promising prospects for enhancing and growing V2X networks. New communication protocols are necessary for vehicle-to-electro-X (V2X) vehicles to improve efficiency, safety, and dependability. V2X interactions may also become more complicated as a result of security and privacy concerns with wirelessly connected vehicle sensors. Wireless channels are transmitted in the environment, which is both a limitation and an annoyance. Therefore, advancements in wireless infrastructure are needed to guarantee the ubiquitous connectivity and broadband coverage of future V2X networks. The data transmitted via V2X must be secure and reliable. This is crucial for establishing trustworthy transportation networks in smart cities, as data privacy and security infractions are becoming increasingly commonplace in everyday life. This research provides a brief analysis on the challenges and issues on V2X and V2V models that helps researchers to design new models for providing better routing and data security models in VANETs.

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