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Security and Privacy Preparation for 5G Services

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Abstract. 5G is the new wireless technology. In vehicles, it is used to support the network associates for sensor on the provide and roads V2X service to drivers and pedestrians. The 5G V2X (vehicle to everything) communication is a benefit to us, for low latency, high reliability and large communication coverage. In this novel, we survey how the 5G technology is used in autonomous vehicles. Mainly we review the architecture of 5G, V2X communication and its uses. And then we discuss mobile network evolution. we also provide the advantages of 5G technology in autonomous vehicles and 5G design principles. This paper also outlines how 5G technology is used in Artificial Intelligence (AI). Finally, for a future generation, there is predictable to pay more attentions and effort into developing 5G V2X services.

Keywords: 5G, V_2X communication, latency, mobile network evolution, autonomous vehicles.

1. Introduction

The next advanced generation i.e., 5G which is new wireless technology. 5G millimeter wave is the fastest, actual speed often being 1-2 Gb/s down. V2x communication is essential for connected vehicles, which can reduce save lives by allowing automobiles to travel on the road "hear" broadcasted signals from their surroundings [1, 2]. The evolved packet system (EPS) of the 3G LTE, also known as the evolved universal terrestrial radio access network, is the result of a joint effort by various stakeholders [3, 5]. To build LTE advanced vehicle connections, increased with multi-access edge computing, to deliver solutions that are both adaptable and affordable for promoting V2X adoption on the route to 5G [6-10]. Radar, lidar, sonar, GPS, odometers, and inertial measurement units are among the sensors used by self-driving automobiles to sense their environment [11-14]. A lack of security measures and architectures for 5G networks is a major problem with the current 3G and 4G networks. There are a number of new services and technologies in the 5G network that necessitate new security solutions and architecture. 5G technology may be used for traffic control in the future. For delay in the authentication process for vehicles or unmanned aircraft, it was not required to have critical latency requirements (UAVs). Expected 5G will go above 4G and earlier cellular network generations' popular hop-by-hop and radio bearer security [15-17].

5G, V2X is a new encrusted paradigm that allows for increased connectivity via devices installed in vehicle and on the road, as well as remote V2X servers. This article looks at different ways to increase the stability of V2X communication on the 5G networks, with a focus on the trust, privacy problems, security that come with 5G V2X [16, 17].

2. Literature Review

In 2014, we must develop information exchange technology to increase traffic efficiency. The developed technology contains all of the details for European cooperative systems' standards and related industry specifications, encompassing essential areas such as admittance knowledges, system and transport protocols, amenities, requests, safety, and management. [4] In 2016, Both the on the 3GPP EPS, this session focused on network design and the need for flexibility in order to meet various use cases. There will be many distinct use cases, technologies, and deployments in the future of 3GPP EPS interconnected with each system's capability tailored to its original purpose [2]. For example, the proposed reporting service protocol is designed to benefit from the anticipated capabilities of 5G cellular networks, including high-speed connections and low latency [17]. Furthermore, it provides high levels of security and privacy protection against attempts to identify a participating car or reveal the contents of a recorded accident video [5]. In 2017, 5G will rely on Cloud computing on the go, software-defined networking, and virtualizing network functions to overcome substantial connection, flexibility, and cost challenges. These technologies, for all of their benefits, nevertheless represent major security risks [17]. The security threat vectors cannot be fully realized at this time due to the limited implementation of many technologies in 5G [8]. Security and privacy breaches can be reduced from the beginning of the design phase to the final deployment if these issues are taken into consideration [6]. In 2018, a viable Because the 5G network demands extremely low latency, not all data can be kept on distant cloud servers. Distance and network link congestion increase latency [7, 12]. Artificial Intelligence becomes crucial in order to optimize this type of problem in a network [8].

In 2019, wireless networks will be able to connect nearly every aspect of our lives, from our smartphones to our refrigerators and advanced cloud computing techniques (e.g., MEC), SDN, NFV, and massive MIMO will be employed in 5G to incorporate new things (IoT) and services [3]. 5G is gaining traction as a platform for connecting sensors and vehicles on the road, allowing drivers and pedestrians to take advantage of vehicle-to-everything (V2x) services [12]. The ability to establish a high-quality 5 G mm-wave communication link with a low-speed autonomous vehicle in a typical V2I situation. Hundreds of sensors were utilized in self-driving cars to make them faster and smarter; these sensors produce a lot of data [9, 10].

3. Methodology Analysis

3.1. 5G V2X Architecture

To illustrate the five tiers that make up the 5G V2X architecture, we've included a diagram in Figure 1. The 5 G access network consists of a non-3GPP or next-generation

radio access network (NG-RAN) that connects the 5 G core network to user equipment (UE) such as on-road cars, networks, and sensors, and pedestrian-driven mobile phones. PC5 and LTE-Uu are the two modes of operation for 5 G V2X communications.

The network edge is located at the top of non-3GPP access networks, such as NG-RANs. The computer and storage resources, as well as key network services, are located at or near the edge of the access network's perimeter network. It is necessary to enable V2X services that are time- video and map sharing, vehicle platooning, and road surface ice detection are some of the new technologies that are being used to improve safety on the roads. V2X services can be improved by offloading computation and caching data to edge V2X servers, which leverage processing and storage resources at the edge of the network. In terms of 5G V2X communication, vehicle-to-vehicle (V2V), vehicle-to-infrastructure, and Vehicle-to-pedestrian communication is one example (V2N). Cooperative awareness, cooperative sensing, cooperative maneuvering, and awareness of vulnerable road users (VRUs) are some of the application cases of 5G V2X that can be categorized [1].

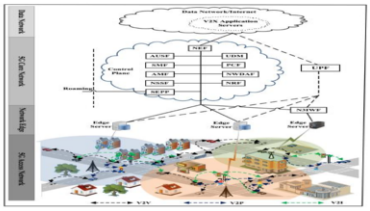

Figure 1. The architecture of 5G V2X.

3.2. Mobile Network Evolution

E-health, IoT, and vehicle-to-anything (V2X) services must be added to the EPS to satisfy the needs of future flexible mobile networks that can accommodate advanced architectural concepts such as eHealth, the Internet of Things (IoT), and vehicle-to-everything. Both old and current radio technologies should be included in an upgraded EPS design [2].

- A multi-service, context-aware adaptation.
- Mobile networks have multi-tenancy.
- Evolution is occurring in mobile networks, based on these two factors.

Figure2: Evolution of mobile networks

3.3. Security In 5G

5G design principles are used in self-driving cars. The design principles are discussed in the below Figure 3. We can control traffic and cars with the help of these concepts. 5G has very strong security. 5G will make it possible for everything in life to be connected." Capacity and efficiency of the technology is rising, making it possible to add a lot more content to the network. In order to overcome the data or network security concerns, it is necessary to apply AI to these problems [3].

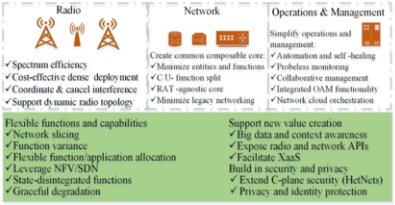

Figure 3: 5G design principles

4. Result and Discussion

4.1. Security-Enhanced Network Slicing:

Illegal autos need additional authentication and authorization to access network slices. Unauthorized cars may use resources meant for approved cars. The NSSAI may be linked to a service reserved to police officers and doctors. If the NSSAI is transferred unsecured, drivers' privacy is at risk.

4.2. Privacy-Preserving Network Data Analytics:

In a single network slice, the NWDAF builds the network that is sent to 5G users or V2X service providers based on historical data. An information list or service IDs are provided by each NWDAF. Data is collected from multiple sources that correspond to the examined service, such as data on the behavior of a single vehicle or a group of vehicles, and information on how many cars are present in a certain geographical area. This, as well as network data analytics privacy, are necessary for the security of 5G V2X communications.

4.3. Secure Driving for Automated Vehicles:

Modern smart cars have insufficient safeguards. To ensure the robustness of autonomous functions, two research directions can be followed: 1) how verified data analytics can be established for the discovery of minutes of machine education faults; and 2) how vehicle security features such as firewall and intrusion detection systems can be constructed [1].

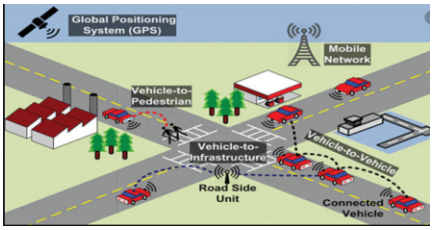

Figure4: Self Driving Cars with 5G technology

5G will bring biometrics to next-generation mobile networks. The wired world has moved from 1 G to 5 G. (or 5 G). 5G helps autonomous cars adopt novel safety measures. Suppose a self-driving car can't maneuver due to an accident-caused traffic bottleneck as shown in Figure 4. The autopilot feature could hand the driver over the reins. However, in the case of an elderly or a blind driver, it would not be necessary. Consequently, many tech businesses Qualified remote pilots in a simulator can take control quickly. A secure and speedy 5G connection would be important. 5G can offer passengers in self-driving cars high-quality infotainment. Communications providers will be a key partner for autonomous vehicles.

4.4. AI in 5G Technology

LTE small cells are gradually being deployed in 5 G networks to meet the high demands on traffic. Such small-scale cells are distinguished by their volatile and complex patterns of interference, increasing the market for self-optimized solutions that may result in lower declines, higher data rates, and lower operating costs. The expectation is that 5 G will be much quicker and that the OTA time will, therefore, be reduced. We don't know how long it will take for most AI self-driving cars to usually do OTA continuously, but at today's slower wireless speeds and probably with massive updates downloaded or the voluminous data uploaded, it might often take hours to do. AI self-driving cars are likely to have communication capabilities through V2V (vehicle-to-vehicle) [8].

5. Conclusion

In today's environment, picture segmentation has become a crucial element of comprehending images. With the growth of picture collection, there is an enormous amount of data that cannot be accessible directly. In order to analyze and extract information from these pictures, segmentation is essential. The segmentation of images has a promising future and has been the focus of modern study. The usual segmentation methods were addressed here: edge detection, clustering, and region growth. The problem with segmentation is that no one approach is suited for a certain type of picture, nor are all techniques applicable to all images. Despite years of research, no widely recognized approach exists, and the literature on colour picture segmentation is relatively sparse. We also went through various hybrid segmentation and colour image segmentation approaches. The hybrid techniques simply demonstrate that by combining the techniques, better segmentation results are obtained.

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