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The New Paradigm of FinTech and CyberSecurity

Management of Transport and Logistics in Ports Using 5G Technology

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Abstract: This poster focuses on 5G applications in the Transport and Logistics (T&L) sector. One of the advantages of these applications is the speed and bandwidth of 5G that allows access to data from both sensors and various smart devices in factories and warehouses. Meanwhile, data traffic is not increasing. Thus, end users can obtain more data in real time, data that is from different systems and smart assets in a unit (example: telematics-enabled lift trucks, drones, conveyor and sortation, camera systems, or motors and pumps compatible with IoT connectivity). All this is highlighted in the VITAL-5G project, which aims to improve the effectiveness of the way T&L verticals interact with the 5G network. This is done by providing innovative platforms and services, which were created to promote these capabilities of the T&L industry and also to have services not known to their customers. In order to achieve everything that the project has proposed, it is necessary to realize first of all, a marketing strategy where a market analysis will be done to see what is the state of the market, then to obtain information, captures market value chain trends and to identify factors and/or barriers in the T&L 5G ecosystem.

Keywords: 5G; IoT; Transport; Logistics(T&L)

1. Introduction

Industries are confronting a new and unprecedented challenge to adapt their operational decisions to a more responsible and sustainable framework on a global scale. Ports are no exception since they are essential economic ecosystems whose operations considerably influence the environment and community. As a result, pursuing sustainable growth at ports in terms of the economic, social, and environmental components of sustainability is becoming increasingly crucial. This result necessitates continually keeping the goal of creating economic, social, and financial benefits (Karapantelakis, Fersman, Vulgarakis & Schrammar, 21 July 2020).

The seamless movement of materials and finished products in supply chains is dependent on freight transportation and logistics (FTL). The FTL sector, like many others, is undergoing a digital

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transformation. The application of digital technologies to enhance existing and innovative freight transportation and logistics service and management is known as digitalization. It frequently entails significant adjustments: (Inam, Schrammar, Wang & Karapantelakis, 2016)

1. within organizations.

2. between organizations.

3. at the ecosystem and industry level.

Artificial intelligence (AI) and machine learning, 5G, blockchain-based distributed ledger technology, pervasive computing, data analytics, and immersive technology are all advancing quickly (Zhang & Xi, 2016; Flugge, 2017) .

2. European and International Market Overview

The 5G IoT global market size expects to expand from USD 2.6 billion in 2021 to USD 40.2 billion by 2026, at a Compound Annual Growth Rate (CAGR) of 73.0% during the forecast period. Regarding the speed, massive capacity, and super low latency of the 5G network, 5G expects that it will be an enabler in expanding the IoT (Markets and Markets, Accessed 01.04.2022). The 5G network can support many static and mobile IoT devices, having a diverse range of speed, bandwidth, and quality of service requirements. The uncommon speed, large bandwidth, low latency, tremendous scalability, and high reliability of the 5G network stack applications, such as VR/AR (virtual reality/augmented reality), AI, and autonomous vehicles, with high data density and rapid response requirements, thus enabling faster adoption of these technologies.

The countries expected to launch 5G services earlier include the US, China, South Korea, Japan, the UK, and Germany. Countries with a robust 4G infrastructure expect to be the early deployers. Countries that have agile connections platforms in IoT are also likely to quickly transform their services into 5G, probably by 2020 Q1. Figure 1 summarizes the opportunities in the 5G IoT market.
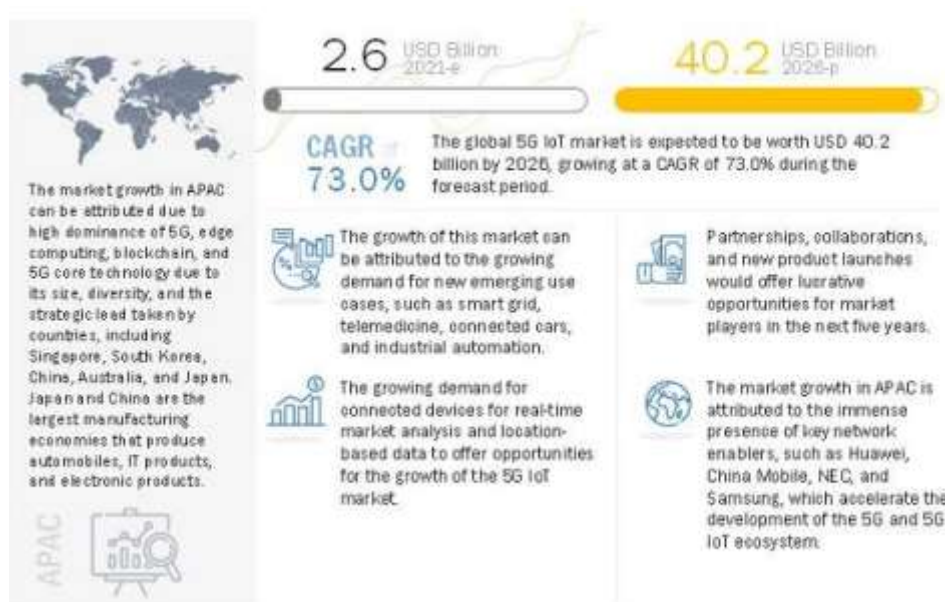

Figure 1 The opportunities in the 5G IoT market

3. 5G Application and Use in T&L

3.1. Autonomous Vehicles for Logistics

A key enabler for autonomous vehicles used for logistics, where every millisecond matters, is 5G, with its low latency, which can reach up to 50 times faster than 4G, with 5G data being transmitted with a lag time of only one millisecond. The warehouse operation is safer, and deliveries are more reliable due to the shorter time for an autonomous vehicle to make a decision. The team of Ericsson, Einride and Telia (Ericsson press release , Accessed: 28.03.2022 [Online]) produced a sustainable, reliable and safe transport system through their autonomous, 5G-powered trucks. As part of an intelligent transport ecosystem, a fully electric driverless truck called "T-Pod" has been introduced into a logistics unit in Jönköping, Sweden.

3.2. Faster and Safer Port Operations

The Livorno port has become a testbed for a new 5G - enabled innovative digital platform (Ericsson, Accessed: 02.04.2022), performing faster and safer port operations. The sensors, cameras, and devices are connected to a network to form intelligent transport and an integrated communications system. Intelligent unmanned terrestrial vehicles are capable of loading and unloading automatically and transmitting their cargo inventory information while they can gain access to controlled areas. The system's backbone is the fast, reliable, high-bandwidth connection, which is only possible with 5G speed and performance. New possibilities open up thanks to these digitization efforts. The port shows that a lean, safe and efficient operating environment is due to IoT synchronization and artificial intelligence with good connectivity.

3.3. Augmented Reality (AR) Applications

If supported on a 5G network, sophisticated AR applications in logistics, such as vision picking, will significantly improve. Improvement of the user experience for AR applications thanks to the reduced delay time that allows for instant updates on freight movements, visually indicating the latest changes. The staff managing storage operations will be more efficient and reduce errors reduced.

Due to the shorter time required to transmit information to AR-activated devices, the order picking, assembly and repair processes powered by 5G in the warehouse can also increase speed. For example, it can save valuable training time and additional labour costs, where teams equipped with hands-free glasses can rely on the software to display step-by-step instructions for the assembly or repair through the lenses in real-time. For example, with can be saved valuable training time and additional labour costs, where teams equipped with hands-free glasses can rely on the software to display step-by-step instructions for the assembly or repair through the lenses in real-time.

Furthermore, losing cargo, incorrect intakes of parcels and loss due to human error, poor management and inefficiency can be reduced when 5G achieves its full potential.

4. Conclusions

Even though 5G technologies have not yet reached all markets, there are great chances that all the possible applications will arise thanks to their qualities. It can improve the previous networks' services and bring new and more innovative services never witnessed. The rising concepts of the Internet of

Things and Intelligent transportation systems are two of the main concepts that will support the appearance of 5G technologies. At this moment, it was possible to reach a basic level of services based on IoT due to the limitations of 4G technologies. Still, thanks to the possibilities of network availability anywhere, at any time with a higher data rate, we could finally have real connectivity among a dense population of mobile devices. Despite all the significant advantages that show the coming of the 5G era and the IoT, there will remain problems to face in the technological field (such as solving coverage and bandwidth required for real-time applications). However, social and ethical issues are related to the inclusion of new services that will not be easy for the population to assimilate. Like in the case of self-driving vehicles inside the city and possible undue access to the users' personal information, we will share all our data in the cloud.These problems are related to security, but seen from the side of avoiding fatal accidents in one case and on the other hand seen as protection of private information.

The paper enriches the 5G landscape with a new use case for river port and ship monitoring. In future work, we envision deploying a 5G testbed for multi-modal mobility.

5. Acknowledgements

References

*** Ericsson. *Digitalizing port operations with 5G.* https://www.ericsson.com/en/cases/2016/5gtuscany/digitalizing-port-operations-with-5g (Accessed: 28.03.2022).

*** Markets & Markets. *5G IoT Market*. Retrieved from https://www.marketsandmarkets.com/Market-Reports/5g-iot-market-164027845.html (Accessed 01.04.2022).

Amer, H.; Al-Kashoash, H.; Hawes, M.; Chaqfeh, M.; Kemp, A. & Mihaylova, L. (2019). *Centralized simulated annealing for alleviating vehicular congestion in smart cities*. 142, pp. 235–248.

Ericsson press release. (Accessed: 02.04.2022 [Online]). *Ericsson, Einride and Telia power sustainable, self-driving trucks with 5G*. Retrieved from https://www.ericsson.com/en/press-releases/2018/11/ericsson-einride-and-telia-power-sustainable-self-driving-tr

Flugge, B. (2017). *Smart Mobility - Connecting Everyone: Trends, Concepts and Best Practices*.

Handte, M.; Foell, S.; Wagner, S.; Kortuem, G. & Marron, P. (2016). *An Internet-of-Things Enabled Connected Navigation System for Urban BusRiders*, pp. 735-744.

Inam, R.; Schrammar, N.; Wang, K. & Karapantelakis, A. (2016). *Feasibility assessment to realise vehicleteleoperation using cellular networks*. pp. 2254–2260.

Karapantelakis, A.; Fersman, E.; Vulgarakis, A. & Schrammar, N. (21 July 2020). *5G Teleoperated Vehicles for Future Public Transport*.

Mahalik, H.; Bommisetty, S. & Tamma, R. (2016). *Practical Mobile Forensics:A Hands-on Guide to Mastering Mobile Forensics for the iOS, Android and Windows Phone Platforms*.

Zhang, W. & Xi, X. (2016). *The innovation and development of Internet of Vehicles*, pp. 122–127.