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PROSPECTS OF THE DEVELOPMENT OF 5G TECHNOLOGIES IN COMPARING TO LOWER BAND SYSTEMS

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Summary. The article investigates the consequences of the development of 5g technologies in message with lower systems.

Keywords: 5 G (5-th generation wireless technology), network, technology, speed, smart cell concept.

5 G technology is the latest iteration, the fifth generation of the cellular wireless technology. It has been engineered to overcome number of limitations of current and legacy generation networks i.e., 4 G LTE/WiMax, 3 G (UMTS) and 2 G (GSM)

systems.

5 G represents significant improvement over its predecessors, it's making use of a wider frequency bands, have increased data transmission speed, reduced latency, allows more concurrent connections of high capacity devices, and brings energy and cost saving benefits. The fifth-generation wireless technology could achieve transfer rates up to 20 Gbps with latency of 1 ms which is at par with wired networks speed. With such parameters the 5 G technology is suitable for applications where real-time feedback is required, hence it is expected the 5 G will be adopted in applications previously restricted to wired solutions. [1]

The 5 G architecture is making use of IP-based model and designed for mobile and wireless networks and typical setup consists of:

- 1) Main terminal.
- 2) Number of automatic and independent radio access points.

For the external network, such as wide area networks, the wireless radio technology system is considered as simple the IP link. To ensure sufficient data control the appropriate IP packets are routed through appropriate application layer of the IP technology.

5 G technology is expected to achieve high efficiency using most modern modulation techniques and network design such as:

Carrier aggregation is a technique used in LTE cellular networks and it has been designed to improve the overall system efficiency. This is achieved by combining two or more carrier signals into one to support wider bandwidth. The carrier aggregation uses three techniques for aggregation:

- 1) Intra-band contiguous: two carriers are transmitted at neighbouring channels (as in the figure).
- 2) Intra-band non-contiguous: two carriers are transmitted with channel spacing.
- 3) Inter-band: In this technique different LTE bands are used for transmission simultaneously. [2]

To increase overall network efficiency, the cell is sub divided into micro and Pico cells, such spectrum usage allows to have more users in a small geographical area and also to handle the network more efficiently.

It is expected that high availability and bandwidth of the next generation wireless network will be well appreciated by the mobile users and the industrial applications anytime and anywhere. The users will be assigned real IPv6 address so it could be expected that the whole world would feel like one WIFI zone. Also, it is expected that signal will be available at higher altitudes providing network coverage in previously restricted areas. Different versions of the radio technologies will share the radio spectrum more efficiently.

1. High-speed mobile network:

As already was stated above the 5 G is expected to revolutionize the mobile experience by providing the supercharged wireless network everywhere. It would be equivalent to having a fiber optic Internet connection accessed wirelessly. In comparison with the conventional mobile transmission technologies the voice and high-speed data will be shared simultaneously and efficiently using the 5 G technology.

Low latency is also a very important parameter of the 5 G technology since it

enables the deployment of remote control, autonomous driving and suitable for time critical applications requiring minimal delays.

For general public the mobile downloads and streaming will be much faster, devices will be always on and always connected with responsive mobile Internet. 5 G networks will enable to cloud storage to reach its true potential; it will allow remote access to enterprise applications, running tasks with significantly greater processing power requirements. [3]

5 G wireless technologies will open door for new opportunities for which new devices will be developed and manufactured, such as new VoIP devices, smart wearable devices etc. The data exchange between the devices will be greatly improved which in order further enhance applications and overall network performance, since it will be possible data to be transferred directly between devices without the need of central gateway. Such small cell concept used in 5 G will provide benefits for the users in terms of better cell coverage and the data transfer and lower requirements.

2. Entertainment and multimedia

Currently, more than half of the mobile internet traffic is used for video download and this trend is expected to continue, so high-definition video streaming expected to be a common thing in the near future.

5 G will enable games, augmented reality and virtual worlds in high definition accessible from your mobile phone and high speed streaming of 4 K videos in high dynamic range will only be taking few seconds alongside with crystal clear audio. [4]

The events and meeting could be streamed from mobile devices in high definition, same would be applicable to HD TV channels. It could be expected that the Entertainment industry will be one of the beneficiaries of the next gen wireless networks.

3. Internet of Things – Connecting everything

Internet of Things (IoT) is another broad area that would benefit from the 5 G wireless network. Internet of Things will connect every machine, appliances, sensors, devices to the Internet. IoT is expected to collect enormous amount of data from millions of devices and sensors and for these purposes it requires an efficient and scalable network to facilitate satisfy the data collection, processing, transmission, control and real-time analytics.

Currently 5 G is the best bet for the Internet of Things wide adoption due to its flexibility, unused spectrum availability and the low deployment cost. IoT can benefit from 5 G networks in numerous areas, for example:

- Smart Home;
- Logistics and shipping;
- Smart cities;
- Industrial IoT;
- Smart farming;
- Fleet management;
- Healthcare and mission critical applications;
- Autonomous Driving;
- Drone Operation;
- Security and surveillance. [5]

The mass adoption of 5 G technology is expected to have a tremendous impact

on societies where millions of devices will be connected simultaneously in highly populated areas.

Moreover, 5 G is the technological answer that making possible for billions of new connections, and making those connections safe and instantaneous. 5 G is expected to impact many industries such as – automotive, healthcare, manufacturing and distribution, emergency services. And 5G is purposely designed in such a way that these industries can take a full advantage of the wireless cellular connectivity in ways that wouldn't have been possible before, and also leaves space to scale solutions in to the future.

The technology will enable Car 2 Car connections, resulting in an increasingly safe driving experience, allowing real time to about road conditions such as accidents and traffic to share with the road users. [6]

This will allow to create the ecosystems of the future, like smart cities. The communications technology, like Skype and Zoom, will benefit the users who no longer be disturbed by connection failures and delays.

The commuters on the public transport will be able to enjoy various streaming service to watch a movie or plan a demanding game.

With the advent of 5 G technology a remote surgical procedures will become the reality and many people would enjoy the improved healthcare.

Conclusions. The changes on this scale do not happen overnight, so deployment would require significant investments in the research and development and the deployment. For example, work on 4 G technology took nearly a decade and there were substantial challenges along the way. Based on that experience we may conclude that the expected 5 G benefits will be available sometime in mid-twentieth. We believe 5 G will change the world as we know it, that the changes will be substantially more profound than 3 G and 4 G; that it will be no less than revolutionary, similar to electricity or the automobiles, benefitting all countries.

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