THE IMPORTANCE OF 5G

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The new mobile communication technology - 5G – will be a breakthrough factor in the implementation of the great plans for digital transformation and development, its popularization should be expected in the coming years. It is worth realizing that 5G is not only a new generation of mobile telephony (providing high-quality communication between people), but - what is new - an indispensable tool supporting large-scale projects, meeting the diverse needs of urban and rural residents in real time. Contrary to popular belief that the 5G network primarily contributes to the acceleration of digitization in companies and the availability of the Internet in large cities, it is the countryside that may become the largest beneficiary of investments in new generation technologies.

The 5G network works on three frequencies - 700 MHz, 3.4 GHz and 26 GHz. Each of them serves a different purpose and plays a different role. Gigahertz frequencies with a broad range and bandwidth will be used in cities and industrial plants, which implement technologies of the Industry 4.0 area, where the number of devices using the network will be very high. This will require rather big base transceiver stations (BTS), but also a dense network of micro-, pico and femtocells, which will offer a signal range of several hundred to even, as little as, several dozen meters. Tiny devices - located in various nooks and crannies, in street lamps, public transport stops, in buildings, etc. - will somewhat resemble today's home Wi-Fi routers. On the other hand, 700 MHz is the frequency that operates over a long distance, but is not able to communicate many devices at the same time. It is the band that will be used primarily in rural areas, based on the relatively sparse infrastructure of base stations.

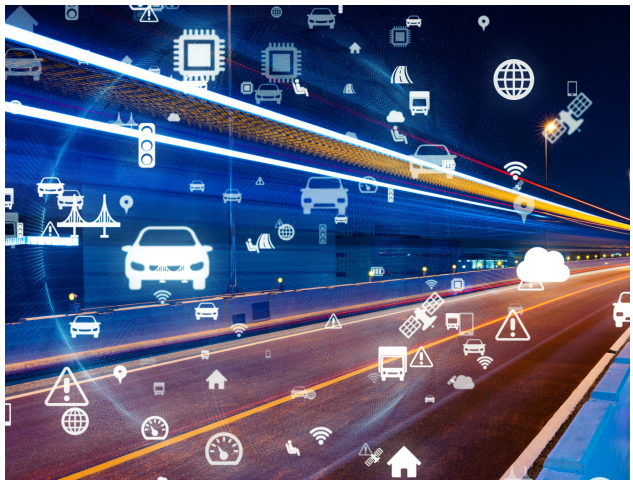
Using the new network standard will not only prevent a crisis in telephone communication, which we would have to deal with, as a result of the exhaustion of 3G and 4G network capacity - which we already observe according to numerous official statistics presented by the Office of Electronic Communications, the Communications Institute or the Polish Economic Institute - but it will also mean a civilization and a qualitative leaps in the dissemination of smart city, smart village or smart home solutions, both in cities and villages.

Full inclusion of rural residents in the circulation of the digital economy, providing them with high-quality access to network resources, services and data, as well as, digital public services at the same level as in cities - will be factors of a fundamental civilization change in the countryside. Thanks to modern networks, both in cities and in rural areas, it will be possible to develop Industry 4.0 - the automation and robotization of entire value chains (including production), as well as the implementation of effective forms of counteracting climate change.

PRACTICAL USE OF 5G

The list of potential projects based on new generation of mobile networks, engaging the imagination and potential of local governments, is long. From air quality control, car park management and thermal energy consumption, through support for waste segregation and disposal, to vehicle traffic optimization and traffic control. The 5G mobile networks will have a strong impact on the development of the Internet of Things, learning at the edge of the network and detailed data analysis. The installation of a large number of edge devices will provide access to large data sets and the ability to analyze them in real time. In turn, the results of analysis will improve the effectiveness and efficiency of various processes taking place in local environments, e.g. in public transport. Cities will be equipped with a special infrastructure, the so-called intelligent poles, on which various sensors will be placed to collect data on air quality, road traffic or the safety of residents.

The ministerial report "IoT in the Polish economy" shows that the implementation of smart city projects based on edge devices brings measurable social and financial benefits, including, for example, limiting the time spent on public transport by 20%, a decrease in crime by 40%, time spent on dealing with matters in city offices by 65%, the response time in emergency cut down by 35% and reduction of harmful emissions and water consumption by 15%. The importance of these technological changes is the most visible in the field of safety management. 5G offers many new opportunities to increase the safety of citizens in road traffic, which is an important area of interest for local authorities, but also law enforcement agencies. Technology alone will not eliminate crime or guarantee security, but it can contribute to a more efficient use of resources to prevent and respond to threats. The implementation of 5G solutions will significantly improve real-time video surveillance, allowing for greater wireless network bandwidth, an alternative to permanent connections. 5G provides high image quality, supports higher resolution video, which increases the quality of analysis.



However, we can also look at the security of smart communes more broadly - as a process of improving public safety and automation of reactions in crisis situations. For example, digital platforms for managing the consequences of climate disasters are being developed, They use drones and robots connected through high-speed networks to conduct search and rescue operations. Intelligent technologies using sensors open up the possibilities for many other applications - from detecting potential problems with the maintenance of power grids before possible breakdowns (fires), to quick redirection of traffic after various road incidents.

THE DIGITAL TRANSFORMATION OF SCHOOLS

The use of 5G will also be of great importance when it comes to "distance learning" in schools or during vocational courses. Digital technologies open up many opportunities for schools, and although the pandemic and the need to conduct remote education for many months accelerated the process of digitization of schools, further systemic support for this process is still necessary. What is needed is a new model of digital education, including systemic, technical solutions applicable in this field. Schools should be subject to systematic digital transformation, modernization when it comes to competence, methodology, organization, digital well-being and hygiene, and infrastructure.

A modern school is a place where students should acquire an advanced package of digital competences, exceeding the ability to operate devices and software. Such a package should include, among other things, knowledge and skills concerning internet safety, programming, copyright, and the ability to critically evaluate information. Such high-level of digital education requires well-equipped laboratories and modern educational programs.

Thus, the post-pandemic school will not be an old-style institution that rarely uses online tools for remote education. A school meeting the challenges of the 21st century must be a hybrid institution, ready for full-time education of both students who come to school and those who stay at home for various reasons. A modern school will increasingly use digital technologies to improve the teaching process and activate students within its own walls. When educating the generation of people responsible for building an innovative and competitive economy in the future, it is necessary to promote innovation among young people and make these opportunities available in the most qualitative way, and this is where networks based on the 5G standard come to the rescue.

Access to the Internet in 5G technology will turn schools into spaces of truly modern education. Teachers will be able to create lessons using augmented reality (AR) and virtual reality (VR), use cross-curricular STEAM labs, program robots and work in a 3D printer environment. The quality of 5G will definitely facilitate the activation of students during the lesson, the interaction between them and teachers, but also the personalization and location of teaching, allowing the use of online educational resources anywhere. For the latter, a key role will be played by universal and high-speed Internet access, which can be provided by 5G technology in cities and rural areas.

Investments in it should be treated by local authorities as an investment in the future of the local community, which will largely depend on the level and quality of education of the inhabitants. This short review of 5G applications in the urban and rural environment - far from fully exhausting the topic - clearly shows that it is in the best interest of residents to support the development of 5G network infrastructure by local authorities. This is an important task for the coming years that should be at the top of the list of priorities for local leaders. It is a development impulse, the implementation of which will really transfer the local government community from the 20th to the 21st century.

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The text was created as part of a partnership project "Journey into the world of robotics"

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