

5G Implementation: Too Fast Too Soon or A Great Step Ahead?

The worldwide introduction of 5G paves the way for a complete rollout of the Internet of Things, but among several communities concerns are being raised about the possible health problems arising due to exposure to this high frequency network. In this first Case Study The Golden Investor wants to give insights on both sides of the spectrum.

The current 4G networks have been widely used and developed to officially start the expansion of interconnection between humans and devices, The Internet of Things. The introduction of 5G networks are expected to massively amplify the IoT, which further advances cellular operations, security solutions and network expansions. The 5G network can make whole societies coordinating efficiently. The potential is great, but there are also non negligible risks of integrating such a system in our

society. Undoubtedly there are major positive aspects, but also several points of attention.

Autonomous Driving And How It Could Benefit Us

The rollout of 5G networks makes the introduction of autonomous cars one step closer. Interdistance management between cars using interconnection systems could significantly reduce the amount of car accidents and traffic jams by lowering the reaction time of vehicles to milliseconds. This would mean the so called "harmonica-effect" which is responsible for many traffic jams during rush hours would be extremely minimized. When the density of cars would become too high the inter-connective system could adjust the speed or lower the amount of cars allowed to join. A better flow of cars will result in less time lost for individuals, although certain people will acknowledge negative effects as a result of the system acting as a whole and not looking at the best option for individuals separately. But the overall effect of the better and faster flow of cars will also benefit the environment since there will be less accelerating and braking, which results in less power needed at a lower amount of time.

How 5G Will Be Good For The Industry: Industry 4.0

The Internet of Things in combination with 5G networking could enhance further development of the Industry 4.0. Industry 4.0 is a name for the advancement of automation and data exchange in manufacturing technologies. This includes cyber-physical systems, the Internet of Things, cloud computing and cognitive computing. This evolution of manufacturing technologies creates the ability to create smart factories. Not only interconnection between humans and devices can advance the Industry 4.0, further automation can increase the safety of humans in dangerous and precise work. Humans could be guided in decision-making and problem-solving, systems can even become autonomous and able to make decisions without human supervision. Technological integration in combination with predictive analytics could further develop the intelligence of smart factories and increase their efficiency.

At a point in time supply chain management could become perfectionalized and its next level efficiency which would be accessible to companies all over the world, further

increasing competition. Businesses will be able to make more products with less manpower. Currently rich countries outsource manufacturing jobs to developing and poorer countries to take advantage of low wage rates in these countries.

"The features of 5G has the potential to change the meaning of mobile communications enabling revolution in connected society"

With the rise of Industries 4.0, companies can automate manufacturing, the need to subcontract to low-cost countries may reduce. Developing and poor countries with abundance of manual labour will become victims of this development and will have large scale unemployment leading to social unrest. Countries which can afford 5G enabled Industries 4.0, can greatly benefit from the new opportunities arising. (Rao & Prasad, 2018)

Challenges For 5G & The Internet of Things

Most of the IoT devices will be battery powered and will die off when the battery is drained. Hence, the power consumed by the IoT devices has to be kept minimal, in order to extend their lifetime. These devices need to send data to the server periodically, so they aren't connected to the network all the time. The data sent by the IoT devices is much shorter than usual, so the signaling and control overhead of the frames transmitted becomes significant compared to the size of data in the frame. The overhead resulting from signaling and control signals make up a big part of the total consumed power (Rowell, et al., 2014). This makes power consumption one of the biggest challenges for supporting IoT devices. Moreover, due to the diverse range of applications, various types of IoT devices by several manufacturers will be used, all having different capabilities and requirements. Most of the devices hold their own standards and interfaces for communicating with other nodes and servers. This creates incompatibilities when sensors from different manufacturers are used simultaneously. (Akyildiz, Nie, Lin, & Chandrasekaran,

2016). While signals at lower frequencies can penetrate more easily through buildings, at higher frequencies the penetration is lower. Due to the short wavelength of these signals more connection points are necessary and thus connecting links have to be made in order to have a supporting network in a certain area (Pi & Kahn, 2011). This means that there need to be a web of 5G-nodes, small interconnecting units, in order to get a proper network.

Potential Dangers

From a micro level users of the network are particularly more harmful to privacy-leaks than ever before. Breaches of the system could lead to loss of data, location and identity (Yu, Bai, Yang, Wang, Move, and Liu, 2016). This could then be used against individuals, particularly those at control of governance. DoS-attacks could take over certain parts or nodes of the network which in turn could lead to chaos in a society where humans are used and will become dependent on a automatically working system. A security breach or failure of the system in a fully internalized system of interconnection can be very alarming and potentially harmful. The potential threat of

integrating such a system as part of a society could be a factor holding immense integration down. It is of great importance to understand that automation also means a loss of freedom for those not at control of the system and even more to those not understanding how such a system impacts and uses them. IT-experts and Artificial Intelligence on its own could obtain massive control over the unknowing greater part of the population using this system. Although this all seems very like science-fiction, it is already happening right now. A perfect boost is the lack of caring about the value of data, people use "free" services everyday now without knowing or caring about the fact that they actually pay for their service in return of a very useful set of data. This trend has been growing over the last decade and is the main source of value for multi-billion dollar companies like Google, Amazon and Facebook. Their revenue, power and growth will only increase with the introduction of 5G. The Golden Investor holds its breath on this development.

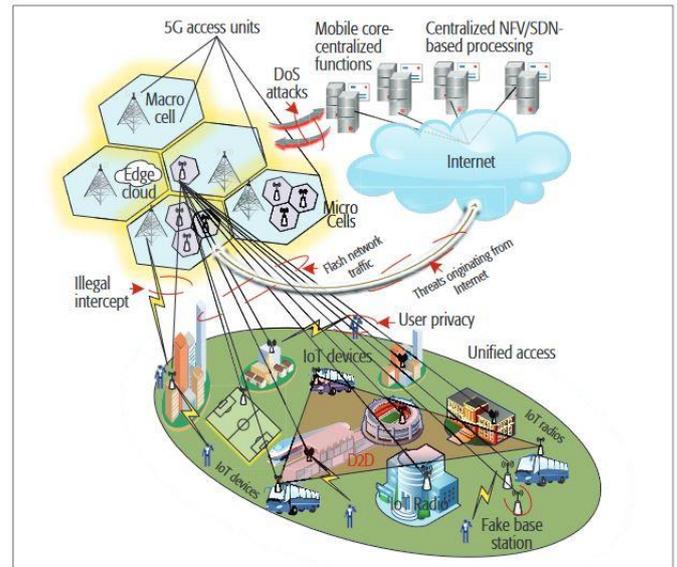


Figure 1 - 5G network and the threat landscape (Ahmad et al., 2018)

Health Risks Resulting From High Frequency Electromagnetic Waves

Concerns were raised among researchers that the frequencies used for this new communication network could potentially be harmful to individuals. The human skin is a great absorbent of all these electromagnetic waves and further research is necessary to prevent potential health risks (Betzael, Ben Ishai, & Feldman, 2018). However there is still dispute over this subject, several studies say that no conclusions can be made yet. The amount evidence of potential health risks is still very low and not significant yet (Simkó & Mattsson, 2019). Evidence is still preliminary and

controversial however more and more results are showing that there is a connection between high frequency electromagnetic waves and oncologic, reproductive, metabolic, neurologic and microbiologic effects. Researchers are particularly pointing at the ever more growing use of devices and antenna's, and raising their concerns over the emergence of 5G and its potential health implications (Di Ciaula, 2018).

Conclusion

Looking at a broad perspective The Golden Investor thinks 5G and further developments in the interconnecting networking technological sector will boost society as a whole to a smart solution based system for the allocation of goods and services. However this needs to be done at a pace where the impact of integrating such a system in

societies won't affect human beings physically and won't harm end-users in their freedom as individuals. In a forever forth-driving world, one should always step back and look at the whole. Where are we going to end, what is the goal and do the benefits exceed the potential harms? The Golden Investor remains skeptical of the true benefits of a system ran by computers. It will lead to centralization of power and increasing difference in wealth which in the long run could become unsustainable.

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