CANDRIAM
A NEW YORK LIFE INVESTMENTS COMPANY

AMAZING TECHNOLOGIES:
THE IMPACT OF 5G

March 18, 2019. A Parkinson's patient in China has undergone the first remote brain surgery operation in a demonstration of 5G's life saving potential (5G is the latest hyper-fast and super-low latency mobile telecom standard). Conducted by Ling Zhipei, a chief physician at the People's Liberation Army General Hospital in Beijing, the operation took just over three hours and involved a deep brain stimulation (DBS) implant being fitted. The most amazing aspect of the story: Prof Ling was based 3,000 kilometres away, but was able to manipulate instruments remotely to conduct the surgery. This was only possible because of the hyper-fast 5G internet connection.

Johan Van Der Biest,
Lead Manager of Candriam Equities L Robotics and Innovative Technology, Candriam

In the not too distant future, remote surgery will enable patients from all over the world to have access to the best healthcare and doctors without having to travel thousands of kilometres. It is clear that the proliferation of 5G technology will have far-reaching consequences for many sectors, for many companies. Internet of Things, Autonomous Cars, Big Data, and Robotic Surgery will be key beneficiaries of this technological evolution. Investors should be well aware of this trend as it will unlock interesting investment opportunities.

FROM 1G TO 5G: WHICH DIFFERENCES?

To understand the massive impact of 5G, it is imperative to understand the basics of the technology and the big differences with the earlier mobile standards.

Where 1G brought us mobile voice calls, 2G allowed for SMS functionality, 3G gave mobile users access to the internet, 4G's higher data speeds made video consumption on your smartphone or tablet a possibility, 5G goes beyond the scope of all of these previous standards and will open up an entirely new world of use cases once fully rolled out. As the fundaments of 5G are built on various underlying standards that need to be tested and verified, real-world deployments will be gradual and take several years to unlock 5G's true potential.

5G, FOR DOING WHAT?

Ultimately, 5G will go way beyond the ability to download a full-length HD movie in seconds, and the real impact will shift from commercial networks to completely new verticals in which thousands and millions of devices on factory floors will be connected and able to interact with each other and in which our vehicles will be able to communicate with other cars and infrastructure on the side of the road. That second wave of 5G will be the key driving force behind what is called massive Internet of Things. Beyond the premise of faster data speeds, 5G in its more advanced form will check all the boxes needed to facilitate a completely new connected world. Firstly, it will allow for ultra-reliable and near-instantaneous latency communications, significantly reducing the time between receiving a sending and receiving a signal to less than 1 millisecond, where this is 10 milliseconds at best under 4G. If you consider a world where vehicles are driving around fully autonomously, minimizing latency will prevent life-and-death situations. Secondly, connection density will dramatically increase from about 100.000 devices per sq. km under 4G to more than 1 million devices per sq. km, thus strongly increasing the number of connected devices in a certain area.

WHERE WE'RE AT

The approval of standards, rollout of costly infrastructure, acquisition of spectrum and regulation make it difficult to determine an exact timeline, but broadly speaking, the advent of 5G should reach us at two speeds. Currently, we are experiencing a first taste of 5G as telecom operators around the globe are switching on 5G commercial networks and smartphone manufacturers such as Samsung and Huawei are bringing their first 5G-enabling phones to market. In reality however, these initial networks which are called non-standalone deployments, still leverage existing 4G infrastructure before migrating to standalone buildouts over time. From a use case-perspective, the 5G packages currently on display from telecom operators in the US, China, South Korea, UK, Germany and more, focus on bringing better experiences to smartphone users, where 5G will serve as an extension of 4G, offering enhanced mobile broadband (eMBB) with peak data rates of up to 20GBps instead of 1GBps.

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CONNECTIVITY ON EVERY CORNER OF THE STREET

In the end 5G will take aim at essentially blurring the delineation between wireline and wireless which requires significant infrastructure investments in the network core and small cell networks (small cells are radio access points with low radio frequency power output, footprint and range). Unlike the big radio towers which were the backbone of previous generational standards, 5G will represent the first time that small cells are considered a material component of a wireless network topology. In reality, this means basically building connectivity infrastructure on every corner of the street. It should not come as a surprise that this explosion of infrastructure needs offers great opportunity to providers of telecom hardware. So why are small cell deployments necessary to facilitate 5G? The reason is that shorter-range mmWave spectrum will be used to connect end-user devices. In comparison to other wavebands, mmWave offers higher frequency and thus faster internet speeds but on the flipside has shorter wavelengths, or simply put, less far-reaching coverage. Hence, the need to significantly increase the density of the network.

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THE DIFFERENT USE CASES

Before diving into different investment opportunities, let's describe a number of use cases that will be enabled by future 5G deployments.

SMART CITIES:

Traffic congestion will be monitored closely by thousands of wireless cameras that will stream traffic data in real-time into a traffic hub. Based on these data, algorithms can control traffic lights; can recommend alternative trajectories, which will reduce traffic jams.

HEALTHCARE:

Remote surgery (cf. supra) is probably one of the best known applications. Another obvious use case is about patient -monitoring in real-time. They will be helped whenever needed (think about heart patient with implanted defibrillators)

MANUFACTURING:

In a manufacturing plant, thousands of sensors will continuously measure temperature, gas concentration, noise,... and based on the streamed data, this will enable to effectuate pre-emptive maintenance, avoiding costly downtime.

AUTOMOTIVE:

Autonomous cars need 5G in order to be operated safely. Nokia's Jane Rygaard said in a recent interview with the BBC: "We need to look at how long it takes for the message to be transmitted between sensors and then get to the computer in each car, and then how long it takes for the computer to make a decision, and all of this has to be in less time than a human would take to make a decision—2 milliseconds. We need a network supporting this, and 5G is that network."

ENERGY MANAGEMENT:

As solar cells become increasingly deployed, it will be imperative to establish real-time communication between the installation and the electricity grid in order to optimize the energy exchange. Real-time monitoring of drilling rigs will help to avoid ecological disasters, as oil companies will be able to react much quicker on any incident that might happen.

WHY IS 5G INTERESTING FOR INVESTORS?

Obviously, many more sectors and use cases can be found that will be impacted significantly by the proliferation of 5G technology, but why is 5G interesting from an investor's point of view?

5G is and will be a source of revenue growth for many companies and these companies deserve to be on an investor's radar screen for the coming years. The most evident companies can be found in the IT sector. Due to the charcteristics of 5G, semiconductor companies such as Xilinx, Qualcom, Qorvo or Marvell are already seeing meaningful 5G revenue streams. Testing of 5G networks and 5G devices enables companies like Keysight, Teradyne, National Instruments to show healthy 5G revenue streams. Network equipment vendors Ericsson, Nokia, Huawei or Samsung are definitely beneficiaries.

As a second derivative, we would like to mention companies that are active in sensors, big data analytics, connectivity, microprocessors. Even if 5G is not always the most important driver for these companies, it remains an important incremental source of revenue growth. Companies that would resort under this denominator are e.g. Silicon Labs, Splunk, AMS, Sensata, Analog Devices, Ambarella.

It is difficult to say when the "true" stand-alone 5G technology will be available exactly, but both customers and investors should be prepared for the take-off of this amazing technology.

We, at Candriam, have been involved in investing in technology for over 30 years. We can fall back on the vast experience of both analysts and fund managers. Moreover, we are supported by an external advisory board, consisting of experts in robotics and innovative technologies. It enables us to select those companies that are best placed to benefit from revolutionary technologies such as 5G, robotics, cloud, Artificial Intelligence or cybersecurity. We strongly recommend investors to consider investing in these exciting technologies, as investing in the future has never been a bad idea.

Because this thematic of robotics is a key investment fields and we think that it should be considered by the investors who want to follow such an innovative strategy.