

Startup

Omar Qaise

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OQ Technology

5G IoT connectivity to every corner of the world

TEXT Marie-Hélène Trouillez

PHOTOS OQ Technology and Nanoavionics
Matthieu Freund-Priacel/ Primatt Photography

Based in Wasserbillig and Leudelange, OQ Technology is developing a technology capable of managing a communication network dedicated to battery-powered connected objects located in remote areas. The system offers a solution that enables the tracking of fleets and goods, oil pipelines monitoring, and environmental sensing where no cellular coverage is available. All this without going through a legacy satellite network, which is designed to support higher information flows and is therefore much more expensive to use. The connectivity provided by the startup will be supported by a constellation of nanosatellites. To launch its solution, OQ Technology has created a consortium with two other partners. The consortium has received 6 million euros from the national LuxIMPULSE programme.

Can you tell us about your journey from your native Iraq to Luxembourg?

I was born in Iraq in 1983. I have always been interested in space since I was a child. As there was no college dedicated to aerospace engineering in Iraq, I studied electronics and telecommunication engineering instead and completed my Bachelor. I graduated with a very high grade, but I always wanted to complete my master in Europe or in the US. In 2004, I was awarded a scholarship from the German Academic Exchange Service (DAAD) to continue my master's degree at the Aerospace Engineering University in Bremen, Germany. During my studies, I worked as a student at the European Space Agency's (ESA) Center of Applied Space Technology and Microgravity (ZARM). The main facility of ZARM is the Bremen Drop Tower. It offers the opportunity for short-term experiments under high-quality microgravity conditions and is the only laboratory of this kind in Europe. I graduated in Bremen and won a prize from OHB SE, Germany's first listed space and technology company, and worked on Galileo,

OQ TECHNOLOGY

THE CONNECT MARKET

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'We offer a cost-effective 5G network for IoT devices by using both mobile 5G chips and a low-cost infrastructure of LEO nanosatellites.'

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PACE

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WE PROVIDE THE
WORLD'S FIRST
UNIVERSAL
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'By 2030, more than 24 billion devices and machines will need to be connected to the Internet.'

Europe's Global Navigation Satellite System. I started my career as a spacecraft engineer at the German Aerospace Center (DLR) in Munich, before moving on to the European Space Agency in Darmstadt. I wanted to work as an engineer, but I was also interested by the commercial side of the satellite business. I had the opportunity to work for four years at SES, the satellite operator in Luxembourg and at the same I studied for an MBA at the University of Strathclyde Business School in the UK. At SES, I transitioned from engineering into business development, selling satellite services to the oil, gas and logistics industry, mainly in the Middle East and Africa. This is how I came to realise that there was a need for users to get cheaper communication solutions relayed by satellite. But when you work for a big organisation, your ideas can't always be implemented.

In 2016, I decided to quit SES. I rented a small office in Wasserbillig, Luxembourg to create OQ Technology. I started recruiting people from Germany, Spain, Belgium... At that time, the Ministry of the Economy launched the *SpaceResources.lu* initiative, aiming to foster a business environment in Luxembourg for innovative space companies. The timing was perfect and OQ Technology was awarded a contract from the European Space Agency under the Luxembourg national space programme LuxIMPULSE and secured a first amount of 100,000 euros in R&D funding from the Luxembourg government to develop an artificial intelligence-based platform to manage the IoT networks. In January 2017, we signed a second contract of 233,000 euros for the design and simulation of a global IoT data platform. Luxembourg was also a major European player in 5G. OQ Technology aligned its strategy from the early standardisation days of 5G to bring this new technology into orbit. We were very successful in our design of the satellite concept and constellation and were awarded a third 6 million euros contract to develop the technology and build one satellite in orbit.

What makes OQ Technology different from other companies?

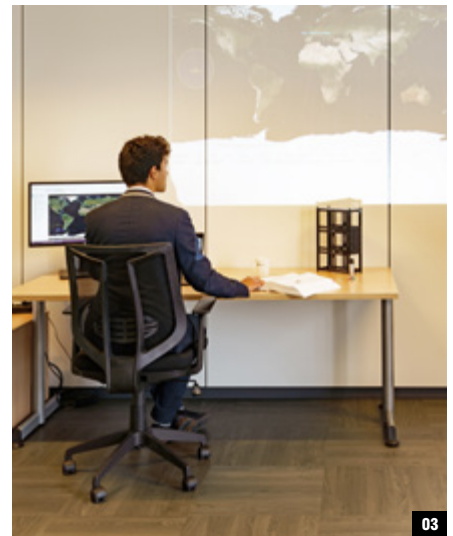
Traditional communication satellites have been in orbit for more than 50 years and today, these existing satellites solutions are

very expensive. It costs 2,000 times as much as cellular communication. Currently, users outside urban areas, where no cellular coverage is available, have to buy expensive satellite equipment and services. Traditional satellite communication requires a big hub or a dish that you have to place on a roof. Moreover, every satellite company comes up with its own technology, so that you are bound to their equipment and system. Geostationary satellites or GEO satellites - like the SES satellites - weigh more than 1,000 kilograms and operate 36,000 kilometers above the Earth. These satellites remain in a fixed position relative to any position. Despite Earth's orbit, this allows ground-based antennas the ability to point directly at the satellite. But they are far away from Earth and it takes time to share content. In contrast, our Low Earth Orbit (LEO) satellites are miniaturised, orbiting versions that operate between 500 and 600 kilometers above Earth's surface and weigh under 20 kg. Due to its low orbit, latency is significantly reduced. 'Latency' measures the time it takes for some data to get to its destination across the network. LEO satellites provide a few milliseconds latency communication, which traditional GEO satellite operators cannot do.

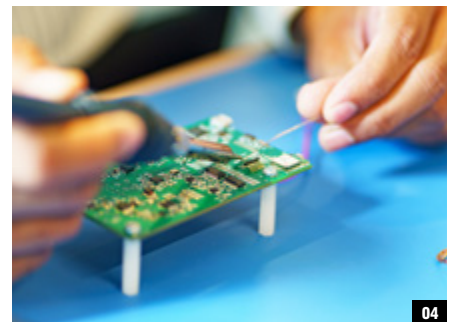
We decided not to develop new technology. The cellular technology 5G exists, but only mobile operators have it and the users are dependent on the cell towers allowing the surrounding area to use wireless communication devices like telephones and radios. Besides, cell tower coverage is very poor in remote and rural areas. So I asked myself, why not take the technology from a cell tower and put it on a satellite? This way, users connect with their existing phone or IoT device to our satellites via cellular standards and get service in remote areas from OQ Technology. It's like having a cell tower flying in the sky. OQ Technology is the first 5G IoT operator building a cost-effective global hybrid system that combines both satellite and terrestrial wireless networks, using regular 5G chips!

What are the services targeted by the 5G IoT satellite provided by OQ Technology?

In the 90s, the world focused on connecting people. Now it's the age of IoT and machines,



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and we need to connect them. By 2030, more than 24 billion devices and machines will need to be connected to the Internet. Our technology offers many applications, but our company chose to focus on a few sectors. Our LEO satellites can play a key role in extending cellular 5G networks to air, sea and other remote areas uncovered by cellular networks. Our main focus today is Africa, the Middle East, Australia, Asia, and South and North America. We target the cellular IoT communication to monitor, control, and track assets in the oil and gas, maritime, and logistics industry. We also target the mining and the defense sector, as well as autonomous-vehicles and drones. Knowing that containers, ships or trucks delivering goods need to be tracked, we can help logistics companies by offering an end-to-end satellite 5G integrated solution that allows the monitoring of assets and fleets in real-time, anywhere in the world. We can also support bidirectional communication to machines such as banking ATMs in Africa or other poor connectivity areas. Maritime connectivity today is limited to expensive VSAT technology and Machine-to-Machine (M2M) high-end terminals. This equipment is too expensive and not suitable for IoT data collection and control. Farms suffer from a lack of cellular connectivity. IoT based smart agriculture deploys a technique which helps in monitoring the

irrigation, the humidity, the temperature and other environmental parameters required by crops to grow. Smart farming monitors different environmental aspects with the help of numerous sensors. The farmers have to monitor the field conditions from anywhere and they require permanent and reliable telecommunication coverage. Our global solution allows smart agricultural devices to have access to our data platform at a very low cost and in record time.

Have you been working with strategic partners or received any kind of support from Luxembourg and abroad?

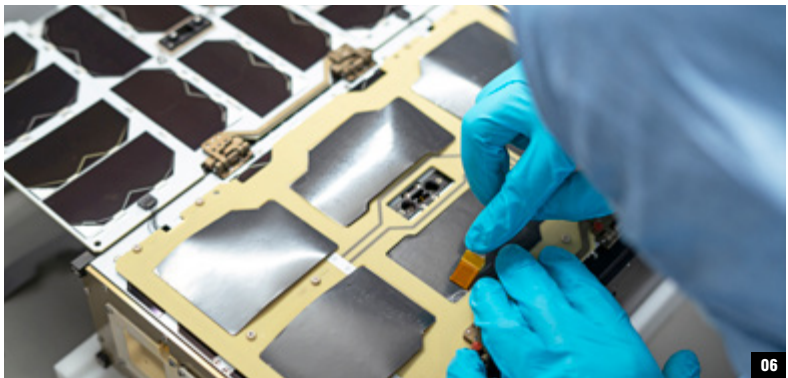
In February 2021, OQ Technology signed a 2 million euros contract. The Grand Duchy provided funding via LuxIMPULSE, the national space programme managed by the Luxembourg Space Agency and implemented by the European Space Agency. The project was targeting oil and gas, maritime, industry 4.0 and transport segments particularly for the management and tracking of assets in remote areas, as well as providing high-value data analytics. We built a consortium that included EmTroniX, a company specialised in electronics development, and Nanoavionics, a globally leading designer, integrator and manufacturer of high-end nanosatellites. OQ Technology recently won a competitive pan-European tender with ESA under the

01. 02. 20 people work for OQ Technology. The majority is based in Luxembourg and the startup is also established in Dubai, UAE and Kigali, Rwanda and is currently working on opening an office in the United States.

03. 04. OQ Technology established the first of its kind European 5G Satellite Test Center in Leudelange, Luxembourg.



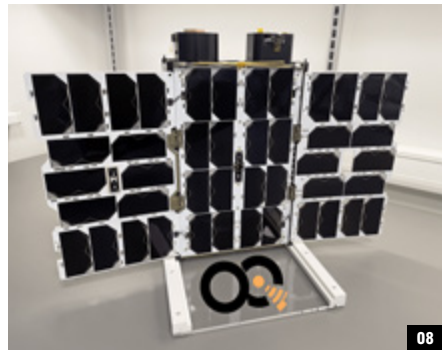
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'On 30 June, 2021, the successful launch of our first 5G IoT nanosatellite was a milestone for us, as it marks the beginning of commercial 5G IoT services and will be followed by a constellation of more than 60 spacecrafts manufactured in Luxembourg.'

ARTES programme to provide technical design and development of a system to address advanced 5G network configurations over LEO, MEO and GEO satellites. To fulfil this fourth contract with ESA, OQ Technology led a consortium made of the SIGCOM research group in the Interdisciplinary Centre for Security, Reliability and Trust (SnT), University of Luxembourg, and Italian ground segment as-a-service company Leaf Space.

OQ technology also signed a partnership with the Mohammed Bin Rashid Space Centre (MBRSC) in Dubai. MBRSC is responsible for a number of space projects including the Emirates Mars Mission 'Hope Probe'. This partnership with MBRSC is strategic for our business and customers. It is also a step forward in the venture collaboration between space institutes and space startups in the region. In addition to government contracts, OQ Technology co-founder, Mohammed Al Muhairi, comes from the oil and gas industry in the United Arab Emirates and self-invested in the company.

What are the biggest challenges faced by startups?

Recruitment is one of the biggest challenges in Luxembourg! It is not easy to find talent with hard-to-find expertise and skillsets in Luxembourg. Then, trying to relocate talent from other countries to Luxembourg, especially with the high living costs, puts pressure on startups. Why not create a programme to assist and retain talent especially

designed for startups? We are very selective when we recruit our people. We give them a technical challenge and they have a few weeks to solve it. If they succeed and if they are highly motivated, we hire them and they are free to take responsibilities. We also offer share-based incentive programmes and the opportunity to be named as inventors in the company patents.

The other challenge, as for every other startup, is private funding. The Luxembourg government is doing an amazing job in funding and attracting space companies, but we need more private local funds and local Venture Capital (VC) financing dedicated to Luxembourg companies. Early stage startups need to raise funds from venture capitalist firms, and there are not many when it comes to investing in innovative space and telecom technologies. We have always been approached by private funds outside Luxembourg, but we would love to work with Luxembourg based investors. Local private investments for early stage space and telecom startups is essential.

Who are your potential and existing customers?

We have two big mobile operators in Europe and one of the largest oil and gas companies worldwide amongst our potential customers.

Why do you have offices in the United Arab Emirates and Rwanda?

We want to be close to our customers.



05. The solution developed by the Luxembourg-based startup enables mobility for users beyond cell tower coverage by having a seamless handover to OQ Technology's satellites anywhere in the world.

06. 07. 08. OQ Technology's satellites are low-cost, shoe-box sized nanosatellites, targeting an orbit of 550 kilometres.

09. 10. On 1st July, 2021, SpaceX Falcon 9 rocket lifted off successfully carrying 88 satellites within a rideshare mission known as Transporter-2. Among those satellites was OQ Technology's Tiger-2 satellite which represents the startup's first commercial satellite to provide commercial 5G IoT services.



There are different approaches, different cultures. We need to talk and discuss face-to-face with our customers and partners. I have always believed that drinking coffee with our customers overseas is necessary! The infrastructure for wide cellular coverage is lacking in many countries in Africa and the Middle East and we help bring 5G there, it is both a commercial and a social mission. For example, oil and gas pipes are often damaged, whether intentionally or not, or suffer from leaks, and that causes major environmental and economic issues. Some companies put soldiers or helicopters along the pipes, but it is too expensive to have them everywhere. If you have sensors along the pipes and satellites monitoring them, you can immediately react and send people to intervene. It helps save the government money and it protects the environment and the people.

What are your next projects?

In July 2021, we were granted an experimental licence for accessing critical satellite and terrestrial 5G frequencies in Luxembourg by the Luxembourg Regulatory Institute (*Institut Luxembourgeois de Régulation, ILR*). OQ Technology has also established the first European 5G Satellite Tests Centre (STC) for LEO satellites in Leudelange. The new 5G STC aims to allow OQ Technology to test all required in-orbit validation, terminals, and payloads as well as 5G IoT devices and satellite performance for targeted 5G frequencies compatible with terrestrial mobile and

satellite mobile bands. It's also the only European 5G test centre for LEO satellites and it is suitable for companies who need to test their IoT prototypes before they are put into mass production.

On 30 June 2021, the successful launch of our first 5G IoT nanosatellite, thanks to our partners Nanoavionics and Spaceflight, on a SpaceX Falcon 9 rocket, was a milestone for us, as it marks the beginning of commercial 5G IoT services by the beginning of 2022 and will be followed by a constellation of more than 60 spacecrafts manufactured in Luxembourg.

We are also thinking about the future. We would like to deploy cellular chip to speak to our satellite constellation. Anywhere in the world, people could use our satellites for a very cheap price. A normal satellite's chip on the user's device costs minimum 100 dollars. As a comparison, the chips on our cell phones cost 5 dollars. Using these cellular chips could allow the users to communicate with our satellites, just the same way they communicate with Tango, Vodaphone or Orange... We are discussing partnerships with big semiconductor providers in the US and in Europe. We want this chip to be global, so that anybody in the world can use it.

Do you have one or two good memories since the creation of OQ Technology?

I remember when we prepared our first ESA project, weeks before the final review - the big exam, so to speak - with experts to show

our results. We were only a small team at that time, and we solved last minute problems until 2 am in our office in Wasserbillig. One of the examiners told us it was the best Phase A he had ever seen! This was so very encouraging for the whole team.

What were some of the bad times you had to overcome?

Entrepreneurs often think too much about the technology, and not enough about the legal aspects before launching the process and scaling it worldwide. As a startup, we've had to learn the hard way how to handle this. Also, working for startups is different from working for large corporates and sometimes it is hard to find the people who fit this environment. Our team is small, and we have had to adapt and carry on as best we could. We are very proud with the results we achieved, and we look forward to expanding the OQ family.

If you were to give advice to young innovative entrepreneurs, what would you tell them?

Be motivated and tenacious. Take risks, join a startup and you will grow! —

More info:

www.oqtec.space