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5G to Turbocharge IoT Growth

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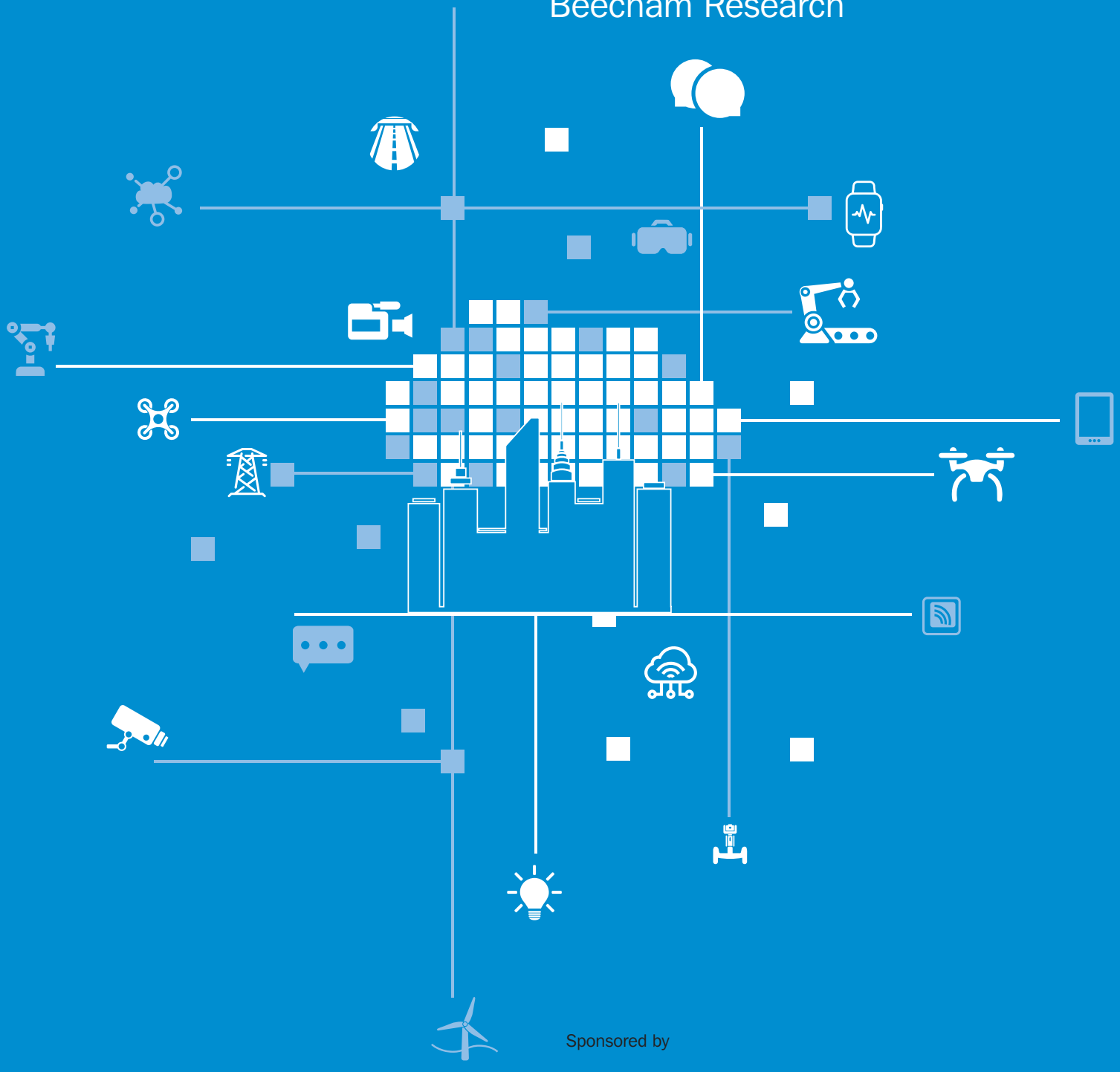

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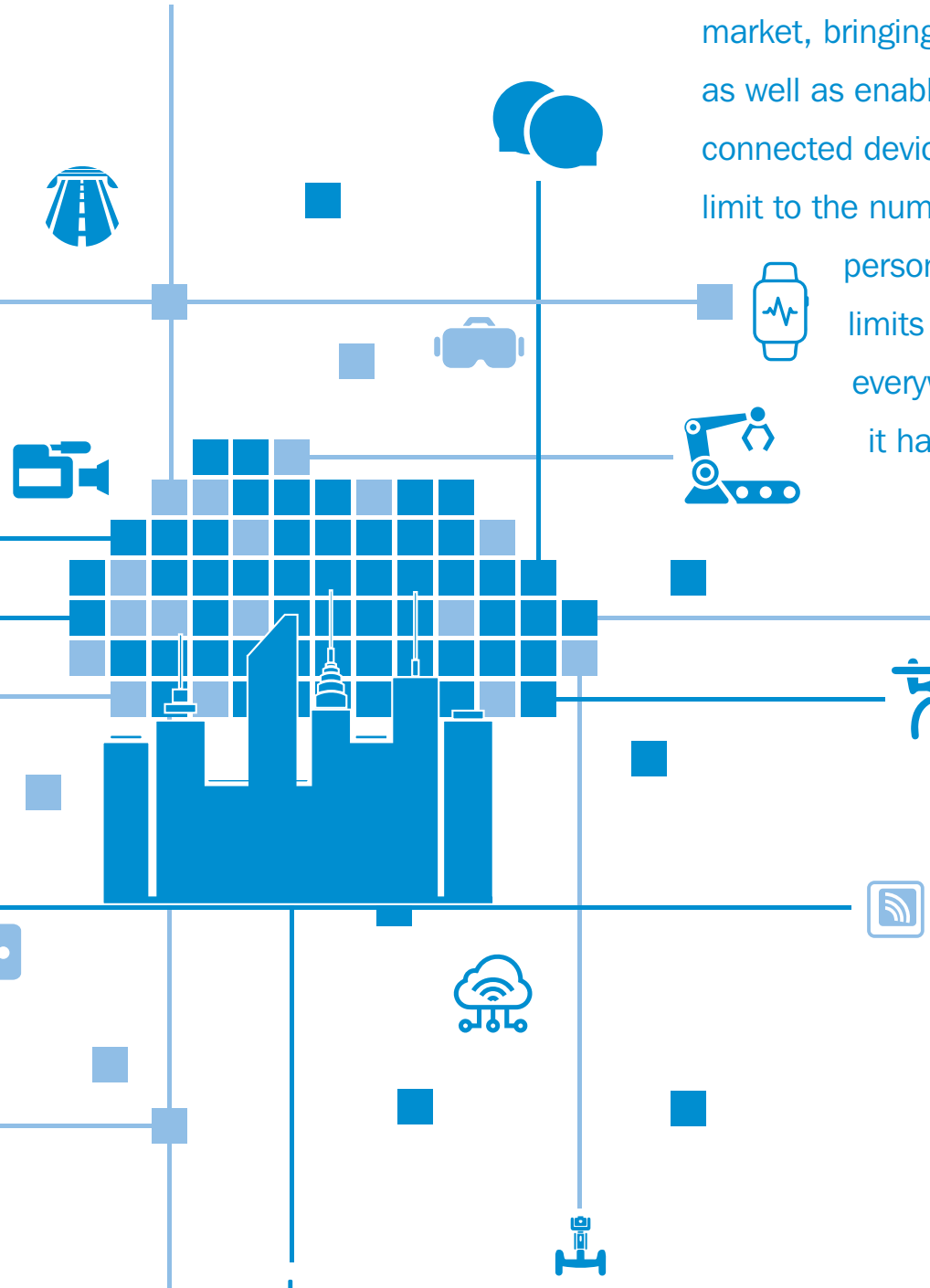
5G is bringing new rich streaming services to the cell phone market, catering for massive increases in broadband use. At the same time, it is set to transform the IoT market, bringing both rich new data services as well as enabling huge new volumes of connected devices. While there is a natural limit to the number of smartphones one person needs, there are no such limits for IoT devices. IoT will be everywhere and 5G is set to make it happen. Pretty soon, there will be more connected cellular IoT devices than cell phones – and that's just the beginning.



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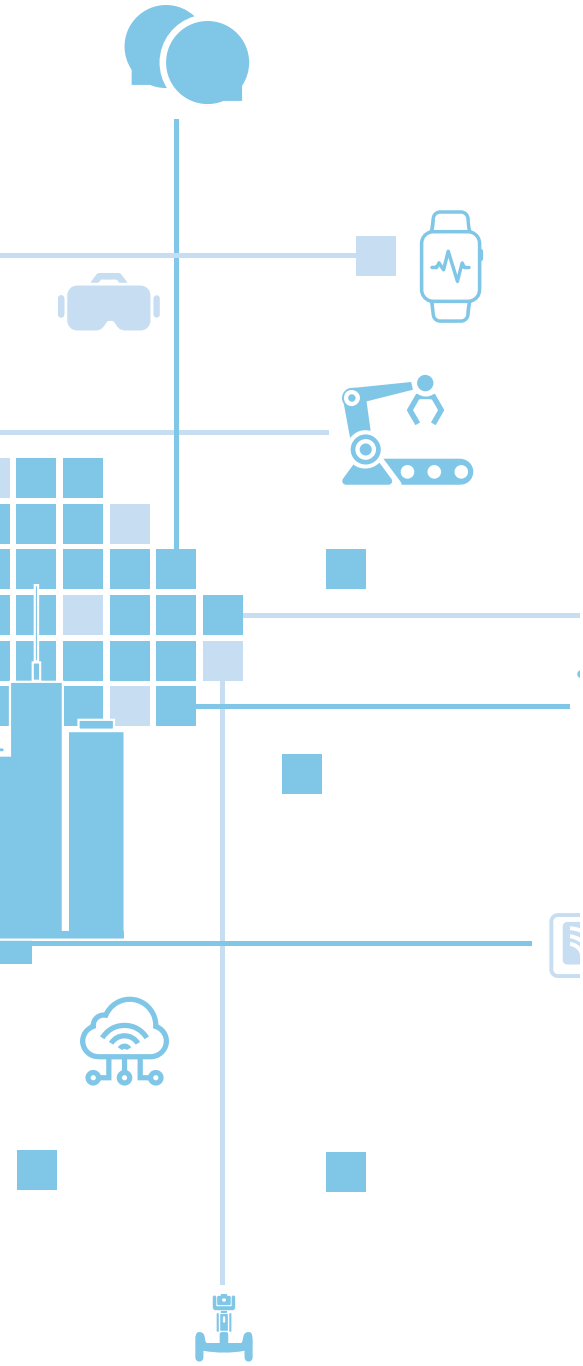

IoT's mix of computing and communications technologies transforms data into real-time and historical information that can be disseminated throughout businesses and their ecosystem of partners and customers. 5G extends the reach of IoT functionality and enables devices to be deployed where they add the most value, including in high-risk environments. In addition, 5G further extends IoT's promise of higher levels of automation and worker safety in the workplace, thereby increasing productivity and overall performance.

5G is the first mobile network generation that delivers wireline performance. It features a combination of three generic services: eMBB (enhanced Mobile Broad Band), uRLLC (ultra Reliable Low Latency Communications), and mMTC (massive Machine Type Communications).

Having three different services enables performance and functionality to align with the different communications requirements of IoT's broad application portfolio. eMBB matches the high data rates, wide area coverage of data-driven use cases. mMTC supports high IoT device densities, the target being up to a million devices in one square kilometre. URLLC supports use cases that require ultra-reliable low latency communications such as industrial automation, remote driving and real-time control.

These developments are particularly significant as 5G was built on a robust foundation, that of 4G, which has an all-IP service architecture. Moreover, the technology has been enhanced and is now being marketed as 4.9G, the implication being the performance is close to that of 5G. This will enable smooth transition of 4G products, solutions and services to 5G.

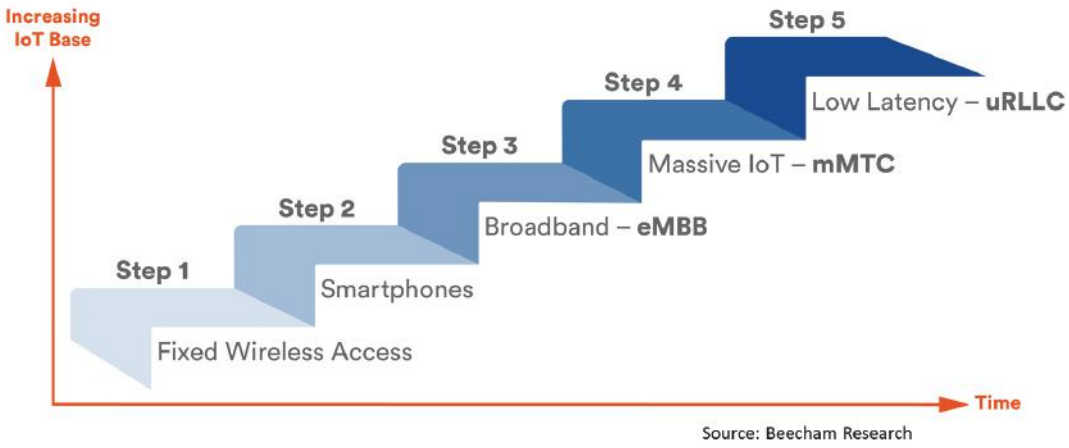

Figure 1: 5G Rollout: Steps Towards Full Implementation.

Figure 1 shows the key steps in 5G rollout and the new services implemented at each step. Step 1 is Fixed Wireless Access, offering the opportunity for wireline broadband performance on a wireless last-mile connection, such as to the home. Step 2 brings smartphone access to 5G, with steps 3, 4 and 5 bringing the three generic services that will dramatically boost the IoT market.

Each of these steps offers new opportunities for IoT applications, with steps 3, 4 and 5 in particular adding to the overall IoT volumes. Step 4 notably adds massive IoT, able to support up to a million devices in one square kilometre. That will cover huge numbers of low data rate sensors, for example, providing essential new data streams for higher levels of automation in everyday life.

What does this mean for Broadband IoT growth?

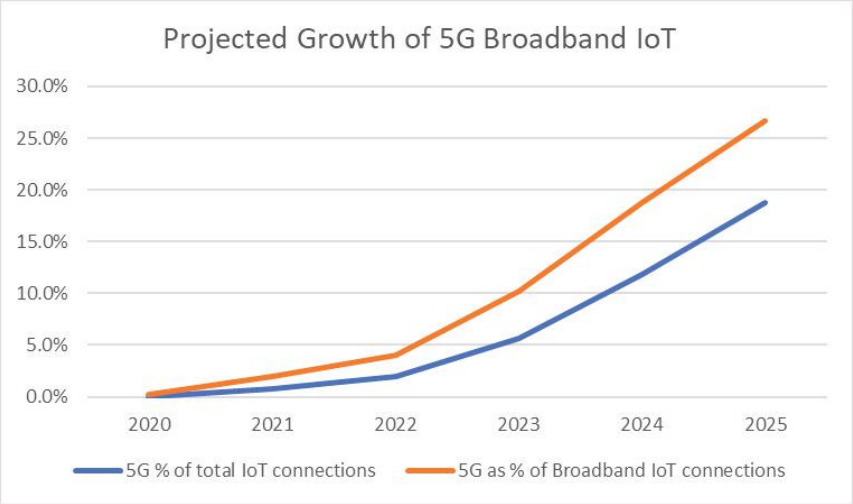

Figure 2: Near Term Projected Growth of 5G Broadband IoT Connections

Taking a closer look at the development of broadband, Figure 2 emphasises the expected strong growth of 5G broadband IoT connections over the next few years. Starting from 2020, the blue line shows 5G broadband IoT connections worldwide as a percentage of the overall cellular IoT connections installed base, including 2G, 3G, 4G and 5G but excluding narrowband cellular (NB-IoT and LTE-M/CatM1). The projection shows a rapid increase for 5G broadband to nearly 19% of all such cellular IoT connections by 2025. Looking in particular at broadband cellular (4G + 5G) only, 5G is projected to grow to 27% of the overall broadband base by 2025. This rapid growth of 5G broadband will then accelerate further, accompanied by an even faster growth of narrowband IoT connections. At these rates, the number of overall cellular IoT connections should exceed the cellular smartphone base within the next decade.

This presents a substantial challenge in supply. The need for 5G in the IoT market is both large and diverse. Enabling IoT to meet this demand starts with the enhanced ability of 5G devices to acquire, aggregate and process data, which in turn starts with embedded modems and chipsets. These products must align with the generic services and module suppliers must partner with leading chipset companies in order to ensure that their products can handle the data intensive workloads. Also needed is enhanced security as cyber-attacks move down the computing stack.

Fibocom meeting the 5G challenges

Fibocom is an IoT pioneer. The company was founded in 1999 and is recognised as a leading provider of IoT wireless solutions and modules. Over 60% of the global staff of 1000+ are engaged in R&D and the company serves 3000+ customers in 100+ countries. The R&D activities as well as strategic partnerships with the leading suppliers of chipsets enable the agile integration of cutting-edge wireless technology into products that have obtained national certifications and network access licenses in 100+ countries. Revenues were $275 Million in 2019 with market cap at $2.2 billion.

Fibocom's 5G modules deliver the required performance for innovative IoT solutions, for example enhanced wireless throughput, latency, connection density, coverage and availability. They are facilitating real-time information sharing between ambulances and hospitals, empowering industrial gateways and addressing communication needs in the energy sector. They are also enabling robots to inspect and troubleshoot in high-risk industries and drones to perform aerial inspections. These are being deployed to examine structures, utility overhead power cables and gas pipelines by transmitting visual data. Such drones are also surveying crops in fields using visual analytics to evaluate growth rates and crop losses.

Fibocom's 5G, narrowband IoT and LTE modules have enabled thousands of companies in numerous vertical sectors to realise innovative smart solutions. For example:

Smart Grid: The term "grid" refers to an "electric grid" that encompasses the complete network, which includes transmission lines, transformers, distribution substations and related accessories that are used for delivering electricity from generation plants to homes and on a commercial scale. Network performance requirements include ultra-low latency (15ms), ultra-reliable communication (99.999% reliability), and high-security isolation. In addition, they must accommodate thousands of connections per square kilometer.

Fibocom's experience and knowhow is reflected in production and control scenarios that include smart grid applications involving intelligent distributed power disruption, precise load control and fault localisation. Embedded Fibocom 5G modules, the FM150 and FG150, fit the bill via their ability to monitor the power line transmission status in real time.

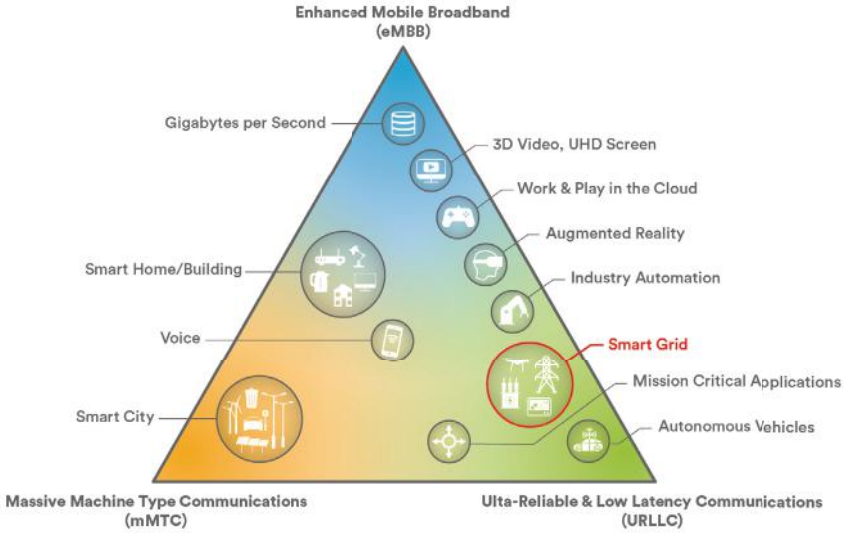

Figure 3: The three generic services of eMBB, uRLLC and mMTC services, together with typical IoT applications they enable.

Smart grid systems have provided the possibility of enabling two-way communication between electricity consumers and distributor, thereby allowing distributors to manage and effectively handle electricity distribution. One of the primary opportunities for smart grid deployments provided by 5G are the capabilities of 5G network slicing. 5G accommodates the connectivity requirements of multiple endpoints and delivers flexibility at a low cost. Network slicing allows heterogeneous services to coexist within the same network architecture. This boosts the security, reliability, and control over the network.

Smart factory and manufacturing: The future of automated manufacturing lies in intelligence. However, regular network communications cannot meet the end-to-end low latency and robust reliability requirements of smart factories. Production lines typically comprise several workflows and compute intensive processes such as video surveillance, machine vision whose performance has been constrained by mobility and bandwidth.

Fibocom 5G modules are removing that constraint. When integrated in communications devices and intelligent gateways they enable intelligent applications such as AGVs (Automatic Guided Vehicles), ultra-HD video surveillance and inspection and data collection by

industrial meters. AGVs integrated with multiple HD cameras need an uplink bandwidth of up to 20 to 50 Mbps and 5G can deliver the requisite service.

Fixed Wireless Access (FWA): Lifestyle changes brought about by Covid-19, including working from home, have highlighted the need for broadband wireless connectivity to support business applications in suburban and rural areas where fibre is prohibitively expensive to lay and maintain. There is a large number of underserved households and this represents a profitable growth opportunity. They typically have a payback time of less than two years. FWA includes LTE and 5G networks running on licensed and unlicensed bands. Customer premises equipment (CPE) embedded with Fibocom modules are enhancing network signals and realising good indoor coverage while delivering a high-speed and low-latency service.

HD live broadcasting: Live outside broadcasts are normally based on camera and an outside broadcast van. The signal is transmitted from the van to the studio using satellite communications, which is costly. Only large TV stations can do this. For smaller stations, businesses, and individual journalists this has not been a viable option to date. LiveU has developed terminal equipment based on 5G that can efficiently and easily solve this problem. The communication terminal LU800 offers multi-channel 4K video coding-decoding capability. The terminal can support four 5G communication links, a 1TB high-performance storage system and a powerful edge computing capability. The cloud can provide server software with a clustered architecture that supports hybrid networking, which can be deployed on both public cloud and edge cloud to support real-time data communication, device management, parameter configuration, and converged communication link aggregation services for multiple hardware terminals.

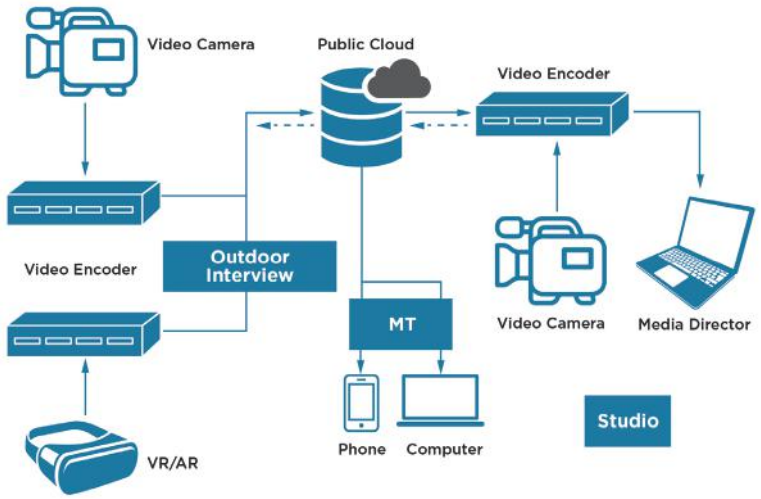

Figure 4: LiveU's mobile individual video communication system is equipped with the Fibocom FG150/FM150 5G series module, which employs the Qualcomm Snapdragon X55 5G modem.

Smart cars and roads: The Internet of Vehicles (IOV) is an integration of three networks: an inter-vehicle network, an intra-vehicle network, and vehicular mobile internet. Vehicle information services connected driving and intelligent transportation are considered three development phases of IOV. 5G's network rate, latency, and access capacity to mobile edge computing and the introduction of network slicing is driving a range of new applications such as automatic driving, perception sharing, remote driving, and high-quality video.

In order to accelerate the company's offer in this key IoT market, Fibocom acquired the automotive embedded module product line from Sierra Wireless in August 2020 and formed a new company, Rolling Wireless Technology Co., Ltd. This is a joint venture by Fibocom and three other professional investment institutions. Dan Schieler, the CEO, joined Rolling Wireless after spending more than 15 years at Sierra Wireless where he was a Senior VP of different business units and worldwide teams totalling more than 1,000 people.

Security: Securing corporate data is a key concern of the business community. MYNXG Connect, a German company based in Nuremberg, holds architectural patents for secure end-to-end encryption. The company supports all industrial interfaces at the device level and provides cloud platform APIs and modelling tools for easy integration from field to business processes.

Fibocom's 5G module FM150-NA, which has completed the three most important compulsory certifications in North America, has been employed by MYNXG for the company's new secure industrial IoT solutions and product portfolio. The solution and products are elements of the MYNXG Industrial IoT Cloud Community and fully integrated with the Nokia 5G network solution. The result is a high-performance smart, secure IoT platform that protects assets, infrastructure and related data to the highest cybersecurity standards.

A comprehensive 5G module portfolio

Fibocom's 5G modules map to the three generic services: eMBB, mMTC and URLLC. They feature high transmission rates and ultra-low latency and enable numerous advanced IoT solutions, such as exploratory drones, highly efficient command centers and telemedicine. For example: The FG650 5G module is a high-performance, affordable module based on the V510, an industrial-grade chipset platform designed by Unisoc. It supports both 5G SA and NSA network architectures and can automatically adapt to 5G NSA and SA dual-module networks. In addition the FG650 supports 5G Sub 6 as well as global mainstream frequency bands. It employs the LGA form factor, which is compatible with other Fibocom 5G modules. This enables customers to switch product lines seamlessly and reduce deployment time to the market.

The Chinese State Grid Information & Telecommunication Group (SGITG) has launched a range of 5G communication terminals for the power industry. The new products are all equipped with Fibocom's industrial grade 5G modules FG150/FM150.

The enhanced version can output microsecond timing signals to serve core business applications in the power industry. It is integrated with MQTT, COAP, IEC-61850, DL/T698, 101/104 and safety certification protocols based on digital certificates.

In addition the portfolio features 5G NR modules compliant with 3GPP R16, FM160(Sub6), FM160W(Sub6 +mmWave), FG160(Sub6) and FG160W(Sub6 +mmWave).

Figure 5: SGITG standard 5G communication terminal

C-V2X (Cellular vehicle-to-everything) is an emerging technology that allows vehicles to communicate with virtually everything around them. It paves the way to next-generation transportation. Fibocom enable high-speed, reliable 5G wireless communication on the vehicle by embedding its C-V2X modules on in-vehicles applications.

R&D chipset partnerships

Fibocom maintains R&D partnerships with the leading chipset suppliers – Qualcomm, Intel, MediaTek and Unisoc. For example, the 5G FG360 module is based on MediaTek'sT750 chipset platform which combines a 7nm compact design with a 5G NR FR1 modem, a quad-core Arm Cortex-A55 processor and a set of peripherals. Everything is integrated on a single chipset. This high level of integration enables customers to design devices that deliver the optimum combination of performance and cost.

Chipsets provide critical computing and communications resources at the edge of the network, resources that are an attack surface and if compromised they could bring the solution down. The responsibility for ensuring robust security is down to the module supplier and it can be verified by certification authorities. Fibocom's modules have global product certification from over 30 authorities.

Unprecedented IoT growth

Fibocom is an established supplier of modules, with a two decade-plus track record that is combined with the proven ability to facilitate the creation and deployment of innovative IoT applications. The company's portfolio of 5G modules is facilitating smart applications for retail, energy, security, automotive and transportation, Industry 4.0, the home, telemedicine, agriculture and cities. They are co-created with global partners in an open collaboration environment and backed by customer service and support that operates 24/7.