Mobile Industry Response to
COVID-19
in China

April 2020

Founded in 1957, the China Academy of Information and Communications Technology (hereinafter referred to as CAICT) is a scientific research institute directly under the Ministry of Industry and Information Technology (MIIT) of China. It cherishes the cultural philosophy of "boosting prosperity with virtues and expertise" for years while adhering to the development positioning of "a specialized think-tank for the government and an innovation and development platform for the industry". Committed to "the think-tank and enabler for innovation and development in an information society", CAICT has provided strong support for major strategies, plans, policies, standards, tests and certification for the development of the national ICT sector and the IT application, thus proving itself an important facilitator in the leapfrog development and innovation of China's information and communications sector. It has been granted hundreds of scientific and technological awards at both national and provincial levels.

Please visit our website at **www.caict.ac.cn**

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators and nearly 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

For more information, please visit the GSMA corporate website at **www.gsma.com**

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To drive the innovation and development of China's 5G applications industry and boost 5G commercialization. CAICT, with the support of the Ministry of Industry and Information Technology (MIIT) and in collaboration with the industry resources, initiated the formation of 5G Applications Industry Array (5GAIA), which aims to promote exchanges and in-depth cooperation between relevant entities, match supply and demand, drive technical innovations, promote knowledge-sharing, draw on each other's strengths, promote 5G applications and effectively advance the development of 5G industry.

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Foreword

The COVID-19 pandemic has caused significant disruptions globally, affecting people's lives, their health and safety, as well as severely interrupting business activities. The impacts are also felt far and wide across the mobile industry as 2020 was shaped to be a critical year for 5G's commercial progress. In this unprecedented situation, people are quickly adapting to innovative ways of connecting and doing business empowered by connectivity, and digital transformation is no longer just a question but an action for many industries. This unprecedented situation is also met with unprecedented response globally where governments, health authorities and many other stakeholders have been working tirelessly together to contain and mitigate the spread and impact of COVID-19. The mobile industry is playing an important part in supporting response efforts that range from ensuring emergency communications, leveraging operator big data, to empowering telemedicine to increase capabilities and efficiencies of health services.

This collection of use cases from the COVID-19 response in China, which is jointly produced by the China Academy of Information and Communications Technology (CAICT) and the GSMA, hopes to share experiences and efforts from China and to encourage global dialogues and collaboration to facilitate more effective use of mobile technologies in the global response to the COVID-19 pandemic.

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4G/5G safeguarding emergency communications

#01
4G/5G safeguarding emergency communications

After the outbreak of COVID-19, mobile operators in China have made every effort, including ensuring communication services for mission-critical stakeholders such as hospitals and government agencies and strengthening the coverage and application of 4G/5G networks, to safeguard the smooth operations of emergency communications for response efforts.

During the construction of Huoshenshan and Leishenshan - the two temporary hospitals specifically designed to admit and treat COVID-19 patients, China Telecom, China Mobile, China Unicom, and China Tower, worked in partnership with Huawei, ZTE and other equipment vendors to deploy mobile communication facilities in these hospitals. They swiftly completed the deployment of 4G/5G communication networks that provided full mobile coverage in the hospitals, that has not only ensured communication services for health professionals and patients, but also supported the needs for hospital operations such as telemedicine and remote consultation. From planning to construction, it took only three days to roll out the communication networks in Huoshenshan Hospital, and China Mobile and China Unicom constructed three 4G/5G sites and five 4G/5G sites respectively within 30 hours.

From late January to 25 March, the communication industry has mobilised a total number of dispatches for 357,000 communication support personnel and 174,000 communication support vehicles, and deployed more than 63,000 new 4G and 5G base stations. The high-quality 4G/5G networks have ensured smooth and uninterrupted communication services in China and provided strong support for the mission-critical response efforts in China during the COVID-19 pandemic.

Network deployments for temporary hospitals

5G empowering medical response to the pandemic

#02

5G-assisted remote ultrasound diagnosis and treatment

Ultrasonic robot is currently the most advanced remote ultrasound diagnosis and treatment technology. Empowered by 5G, the ultrasonic robot can perform real-time operations through remote control and display the ultrasound images simultaneously. Medical professionals can provide diagnosis remotely and guide on-site medical staff in their diagnosis and treatment.

Wuhan Branch and Hangzhou Branch of China Telecom, recognising the telemedicine needs of the medical assistance teams in Wuhan, worked together to rapidly deploy and enhance 5G network capabilities in Wuhan and Zhejiang. The China Telecom Wuhan Branch deployed an outdoor 5G base station (1 5G AAU) within 24 hours, and achieved a full 5G-network coverage in Huangpi Gymnasium Mobile Cabin Hospital.

On 18 February, experts from the Remote Ultrasound Medical Centre of Zhejiang Provincial People's Hospital, which was located 700 kilometres away, remotely controlled the ultrasonic robot to perform ultrasound examinations for patients in Wuhan Huangpi Gymnasium Mobile Cabin Hospital. This was the first time that 5G remote diagnosis and treatment technology had been used to treat patients with COVID-19 since the outbreak.

The application of remote diagnosis and treatment can effectively alleviate the shortage of doctors in affected areas and speed up the diagnosis and treatment of patients.

Remote ultrasound operations

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#03
COVID-19 Telemedicine Collaboration solution
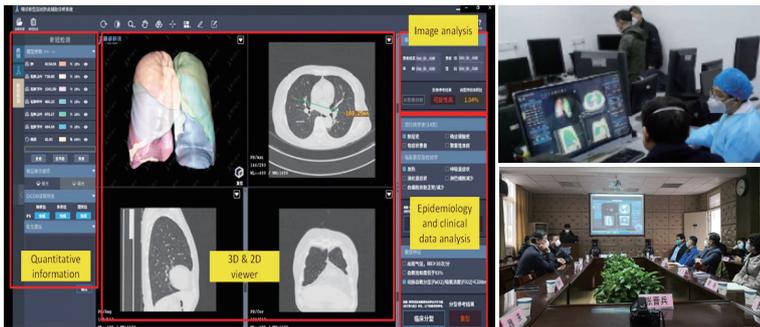
◈ COVID-19 assisted diagnosis system

The COVID-19 Telemedicine Collaboration solution (the "Solution") developed by Beijing JinCheng Medical Technology Co., Ltd., builds on 5G's advanced capabilities and telemedicine technologies to provide an extensive range of collaborative medical services including community screening of suspected cases, remote collaboration of Computed Tomography (CT) experts, AI-assisted diagnosis, and treatment in isolation wards of key hospitals, and online assistance of medical experts .

A CT image of a patient usually ranges from 100 MB to 2,000 MB in size, and could take around 1 hour to be transmitted under a normal Wi-Fi condition but can be done in only 10 seconds in a 5G environment. Taking advantage of 5G and cloud computing technologies, the Solution shares the images files of suspected/confirmed cases online to radiologists around the world so that they could assist local hospitals in the screening of CT images. It enables a new innovative way to collaborate in real-time beyond physical constraints during this trying time. In addition, leveraging big data analytics of clinical data of newly diagnosed cases of COVID-19 in Wuhan and AI deep learning of patients' CT images, the Solution developed the ability to intelligently identify COVID-19 characteristics in CT images. It can perform a wide range of tasks, such as chest CT and clinical assisted diagnosis of suspected cases within 15 seconds as well as classification of clinical severity and the percentage of pulmonary lesions to the total lung volume, which greatly reduce the workload of clinicians and imaging experts, and improve the efficiency of COVID-19 diagnosis.

The Solution has been deployed in multiple hospitals in Beijing, Wuhan, Shanghai, Guangdong, among others. Combined with China Unicom's medical cloud technology, the Solution supported multi-lateral collaborative treatments of severe patients in Wuhan. In collaboration with the World Association of Chinese Doctors, the Solution also mobilised Chinese doctors in the United States, Australia, Canada and other countries and regions. The deployment of remote mobile medical devices has empowered multiple parties to participate in the diagnosis and treatment of COVID-19 in Wuhan.

⬆ remote collaborative diagnosis

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5G enhancing city containment and disease control

#04
5G-enabled thermal imaging to monitor body temperature

The 5G + Remote Thermal Imaging Solution developed by China Mobile was successfully implemented in Fujian Changle Hospital. This solution can pre-screen patients with fever to greatly reduce the risk of contact infection during temperature measurement, and help avoid mistakes and oversights from mental fatigue of medical staff.

There is usually big flow of people at the entrance and exit of Changle Hospital. The thermometer handhelds previously used for temperature measurement were not efficient as they required a large number of staff on-site, which raised the risks of cross infection. The "5G + Remote Thermal Imaging" solution includes infrared surveillance cameras, temperature-detecting blackbody reference, 5G CPE and other supplementary equipment. The infrared surveillance camera collects temperature readings from the target group and compares them with the blackbody radiation reference. It transmits the temperature readings and live video feeds of the detection zone simultaneously to computer stations or mobiles through 5G network that allow for flexible operations.

⊙ 5G-enabled thermal imaging in action

5G supporting the resumption of work and Production

#05

5G-enabled Intelligent Power Inspection Robots for power system maintenance and assurance during the pandemic

China Unicom's 5G Innovation Centre and State Grid Hangzhou Electric Power Company launched the first 5G-enabled cable tunnel inspection robot in China. It is intelligently controllable and can perform unmanned operations and conduct real-time monitoring of power systems. It has been instrumental in ensuring the critical operations of power systems during the pandemic.

The cable tunnel is an enclosed underground pipeline space, and its inspection is faced with challenges, such as flooding, collapse and other safety threats, as well as the significant amount of inspection tasks. During the outbreak of COVID-19, protecting the power supply has been a mission-critical task in the fight against the epidemic that required power grid companies to increase the frequency of inspection and improve the quality of inspection, and at the same time avoid cross-infection of staff due to close contact.

The 5G cable tunnel inspection robot is equipped with a variety of equipment such as 4K ultra-high-definition cameras, infrared cameras, temperature and humidity sensors, and hazardous gas detectors. The inspection staff can inspect and monitor checkpoints in the cable tunnel in real-time from the inspection platform deployed in the Control Centre tens of kilometres away from the actual site. Since the outbreak, the robot has performed remotely controlled inspections over more than 24 kilometres of tunnel.

Remote inspection views from robot

Power system intelligent inspection robot

Promoting the Development of Industry Ecosystem

#06

5G Application Store Boosts Industry Cooperation

The 5G Application Industry Array (5GAIA) brings together top companies, organisations and institutions from the ICT industry, such as China Mobile, China Telecom, China Unicom, Huawei, ZTE, and CAICT to increase dialogues and facilitate commercial expansion of 5G use cases. In order to provide opportunities for enterprises in the 5G value chain to showcase their 5G innovations, advance the cooperation between the upstream and the downstream stakeholders, and promote dialogues and cooperation between enterprises in vertical industries and ICT companies, CAICT and 5GAIA worked together to create the 5G Application Store (www.appstore5g.cn). It offers functions including 5G use case record and demonstration, demand matching, online and offline activities, mapping of industry use cases, and investment and financing services.

It has collected nearly 340 5G use cases from 132 companies and institutions such as China Mobile, China Telecom, and China Unicom, as well as the needs of multiple stakeholders for cooperation in a wide range of areas including communication modules, drones, sensors and has successfully matched demands from more than 20 upstream and downstream companies.

Since the outbreak of COVID-19, enterprises in the upstream and downstream of the 5G industry chain have engaged in close cooperation and contributed nearly 100 5G use cases to epidemic response and resumption of work and production. In the demand-matching segment, some enterprises raised needs for epidemic prevention and control, such as infrared temperature sensors, and the Store effectively connected the supply side with them, which is just one example of how it supported the wider adoption of 5G-enabled application in the COVID-19 response efforts.

5G application store
PC version + applet

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Mobile big data supporting city management

#07
Travel history card based on telecommunication data

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Travel history card based on telecommunication data

CAICT, in cooperation with China Telecom, China Mobile and China Unicom, launched the Travel History Card that leverages telecommunications big data. The Travel History Card enables the 1.6 billion mobile subscribers in China to inquire their travel history information of countries (regions) and domestic cities (stay of more than 4 hours) in the past 14 days through text messages, QR codes, or web portals. It can generate a green, yellow or red indicator according to the epidemic situation of different regions.

With the spread of COVID-19 around the world, it has become critical to accurately identify travel history information of travellers entering China and to screen travellers from countries and regions with severe epidemic infections to achieve early observation, early detection, early reporting, and early treatment of patients that would help curb and contain the spread of the epidemic. The Travel History Card has played an important role in epidemic prevention and promoting work resumption.

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#08

Urban Epidemic Tendency Prediction Simulation System

⊕ City pandemic prediction system

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In this stimulation system, the urban PWR distribution, the UAI and the UWI indexes are estimated based on sampled MNO's signaling data, while the epidemic parameters on the left side can be set and adjusted manually to stimulate the urban epidemic development trends under different prevention and control measures.

In this simulation system, China Unicom Big Data Co., Ltd. proposed a novel infectious disease model - USEIR. It optimises the classic infectious disease SEIR model based on the integration of three population migration indexes: urban population Place of Working & Residence (PWR) distribution, Urban Activity Index (UAI) and Urban back-to-Work Index (UWI), which are generated from analysis of MNO's signalling data. USEIR has been shown to display a good fit against published epidemic data from Wuhan, Beijing and other cities.

In this model, urban population activity index and urban return-to-work index that reflect the high-level situation of urban movement and work activities can be calculated using MNO big data. They directly relate to the effectiveness of city administration's epidemic prevention and control efforts and home quarantine measures.

This urban epidemic tendency simulation system is developed based on actual city data indexes through big data analysis and aforementioned USEIR model. The system is capable of data fitting against preliminary city epidemic data, and providing dynamic simulation of potential spread trends and patterns based on assumptions and interactive interventions of a number of key factors such as urban activity index, return-to-work index, medical treatment capacity, infectious rate, recovery rate, mortality rate, incubation period, treating period, treatment capacity, and healing period. It therefore can provide valuable information and references to help relevant agencies establish effective policies to facilitate resumption of normal social activities and businesses.

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