The Demand and Development of Internet of Things for 5G:A Survey

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Abstract-**The Internet of Things (IoT) integrates the sensing technology and radio frequency identification technology between goods. Recent IoT development has the disadvantages of low reliability, poor security, and high maintenance costs. Moreover, IoT applications should have the special requirements of supporting massive connections, low terminal costs, low terminal power consumption, and super-coverage capabilities in 5G scenarios.**

By integrating 5G with IoT, the information transmission rate can be effectively improved, the transmission delay can be reduced, and the reliability and security of the network can be improved. 5G technology will support the innovation and development of IoT applications, vigorously promote the development process of IoT, and continue to break ground in new areas and discover new worlds.

I. INTRODUCTION

The 2005 International Telecommunication Union (ITU) Internet report formally proposed the Internet of Things (IoT) (Internet of things, IoT [1]) as the ubiquitous network technology integrating goods with the Internet, such as sensor and radio frequency identification devices (RFID) technology.

The application of IoT requires supporting mass connection, low terminal costs, low terminal power consumption, and super-coverage ability [2]. At present, many new technologies have been produced for the development of networking (e.g. RFID, close communication technology, sensor and wireless sensor network technology, nanotechnology, and miniaturization technology). To better meet the demands of IoT applications, the NB-IOT narrowband IoT (NB-IOT) was developed. In the future, there will be approximately 240-500 billion mobile devices or physical entities to connect to the mobile Internet, along with the expansion of application scenarios, increasing challenges in high user experience rates requirements, the large connection density, and low latency. NB-IOT will evolve to realize the demand for continuous hot wide area coverage, high capacity, low power consumption, large connections, and low latency with reliable scenarios

5G [3] is a new generation of mobile communication systems designed to meet mobile communication demands after 2020. The key technology [4] includes multiple-input and output technology, coded modulation techniques, super dense networks, new carrier custom networks, software defined networking, self-organizing networks, content distribution networks, and the D2D(Device-to-Device) communication [5-6]. 5G technology will be highly efficient and flexible to deal with diverse IoT data. At the same time, IoT will provide effective configuration for 5G networks to satisfy user needs, also promoting an Internet boom.

II. IoT APPLICATIONS DEMAND FOR 5G

IoT has been in development for more than 10 years Application development includes mostly industry-specific or nonstandard solutions with the disadvantages of low reliability, poor security, and high maintenance costs.

It is estimated that more than 10 billion mobile devices will be connected to the Internet by 2020, of which China will exceed 2 billion. By 2030, the total amount of all kinds of networked devices in the world will exceed 100 billion. Only through the combination with 5G ultra-dense networking technology can we effectively improve the power and spectrum efficiency of the network, expand the coverage, and increase the capacity of the system and flexibility between different access technologies and coverage levels.

The integration of 5G with IoT [7] will support the development of smart cities on the basis of information sharing, and realize the organic combination of urban governance systems and governance capacity building. It will support autonomous vehicles to achieve communication between vehicles, vehicles and traffic lights, and improve traffic safety. It will also support virtual wearable devices, such as virtual reality helmets, which allow people to experience the world in a new way and use drone technology to search for targets and prevent fires in remote areas [8-9].

In the future, the smart urban development, smart homes, smart transportation, and other IoT will inevitably face the problem of massive equipment connections and information exchange. A large number of sensors are required for the development of IoT. However, the existing sensor connection is limited by the transmission distance, and also has certain requirements on the external environment. Therefore, how to connect the networked devices, how to keep the connected devices connected to the Internet, and how to deal with the relationship between devices that frequently connect to the network must be addressed. In 5G networks, the application of ultra-dense heterogeneous network technology enables the IoT to truly achieve wide area coverage and solve the problem of limited transmission distance. By means of 5G, the information transmission rate can be effectively improved, the transmission delay can be reduced, and the reliability and security of the network can be improved.

III. CONCLUSIONS

The IoT is entering a new phase of "focusing on key points, integrating across borders and integrating innovation" from the stage characterized by fragmentation and isolation. 5G technology has the characteristics of low latency, low cost, high reliability, high bandwidth, and high flexibility, which

will help make the Internet of Everything become a reality. 5G will provide ultra-high capacity bandwidth. It is possible for the mobile device's network speed to jump to 10Gbps and short-distance transmission to reach 10Gbps, which means that people in the future can download a high-definition movie in less than 1s. People can also experience more long-range interaction by highly intelligent networking devices and sensors, and users will be able to enjoy 3D films and games, real-time streaming of high-definition content, and remote medical services.

The future demand for IoT will continue to grow. The core demand for IoT that supports the interconnection of all things in the future is massively connected with ultra-low latency of approximately 1 millisecond. 5G is precisely what enables people to live and work, and provide the key technologies for the diverse businesses need of the region. 5G continuous wide area coverage scenarios will provide users with seamless high-speed service experience; hot spot high-capacity scenarios will be able to provide users with high data transfer rates; and low-power, large-connected scenarios will meet the smart city, environmental testing, forest fire prevention, and other application scenarios. 5G low-latency, high-reliability scenarios will meet the needs of car networking, intensive hot spots, subways, high-speed rails with ultra-high mobility, and high-connection density of the scenes [10].

In the future, the close integration of 5G mobile communication and other wireless mobile communication technologies will constitute a new generation of ubiquitous mobile communication networks. 5G technology will support the innovation and development of IoT applications, vigorously promote the development process of IoT, and continue to break ground in new areas and discover new worlds. What's more, the human life will become much smarter.

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