

Next-Generation Smart Network Expands as Strong Demand Drives Rapid Advancements in Related Technologies



Looking at next-generation networks, a range of emerging technologies are playing pivotal roles. From ground-based B5G (Beyond 5G)/6G, Wi-Fi 7, and fixed wireless access (FWA), to non-terrestrial networks (NTNs) like low-orbit satellites, Taiwan-based companies are actively involved in shaping these developments. Going forward, the telecom sector is poised to see the integration of a new generation of terrestrial networks and satellite communication systems. This will ensure seamless wireless coverage across land, sea, and air. With Taiwan's robust ICT industry playing a vital role, the forthcoming era of AI-enabled smart network promises boundless possibilities.

Involved in Establishing Industry Standards from the Beginning, Taiwan-Based Companies Have a Head Start in the Race for the 6G Technology

As new equipment for next-generation networks is being introduced to the market, the telecom sector widely anticipates that 2023 will herald the arrival of the 6G era. Many companies involved in this sector have also initiated their own 6G deployment strategies ahead of time. The scale of the 6G market is forecasted to exceed USD 40 billion in 2030, and the corresponding CAGR from 2023 to 2030 is projected to be 34.2%. B5G/6G builds on the foundation of three major characteristics and usage scenarios of 5G: enhanced mobile broadband (eMMB), ultra-reliable low-latency communication (uRLLC), and massive machine-type communication (mMTC). Compared with 5G, B5G/6G

promises communication speeds 10 to 100 times faster than 5G, with peak speeds reaching up to 1Tbps. Its latency is set to be just one-tenth of 5G, and its device connectivity is greater than that of 5G by 10 times. "The ITU-R Framework for IMT-2030" released by the Radio Communication Sector of the International Telecommunication Union (ITU-R) in June 2023, outlined three emerging usage scenarios for 6G: integration of sensing and communication, integration of AI and communication, and ubiquitous connectivity. Analysts at TrendForce state that apart from having higher speed and lower latency, another prominent feature of 6G is its support for terahertz communica-

tion Sector of the International Telecommunication Union (ITU-R) in June 2023, outlined three emerging usage scenarios for 6G: integration of sensing and communication, integration of AI and communication, and ubiquitous connectivity.

Analysts at TrendForce state that apart from having higher speed and lower latency, another prominent feature of 6G is its support for terahertz communication. This means that 6G will encompass not only existing ground-based networks as in previous generations but also low Earth orbit (LOE) satellites. Such integration will provide even more comprehensive network coverage. Moreover, 6G is closely intertwined with advanced sensing and AI functionalities, allowing for unprecedented optimization in end-to-end network performance, power consumption, and AI-enabled applications.

Unlike 5G, which mainly operates in the millimeter-wave frequency range (i.e., 24~71GHz), B5G/6G is going to bring about a significant advancement of utilizing higher-frequency millimeter-wave (mmWave) bands (i.e., 71~92GHz) and sub-terahertz (sub-THz) bands (i.e., 92~300GHz). It should be noted that terahertz bands (300GHz~3THz) are not a major focus in the development of 6G at the current stage.

In June 2023, 3GPP held its 100th member meeting in Taiwan, and local ICT companies that attended this event include MediaTek, Chunghwa Telecom, Foxconn, ASUS, Taiwan Mobile, Far EasTone, HTC, Quanta, Pegatron, Auden Techno, Rapidtek, and Askey Computer. Together, 3GPP and Taiwan-based companies are driving the advancement of 6G, and this collaboration will help Taiwan secure an influential position in the global telecom sector with respect to the development and market deployment of critical technologies.

With 2030 anticipated to be the inaugural year for 6G, many leading ICT companies have formulated forward-looking strategies. At this year's Mobile World Congress (MWC 2024), Qualcomm unveiled the world's first prototype of Giga-MIMO antennas designed to operate in the 13GHz band, thereby meeting the higher capacity needs of the upcoming 6G era.

Recently, South Korea's SK Telecom has partnered with Intel to develop "Inline Service Mesh," capable of reducing latency in 6G backbone networks by 70% and boosting service efficiency by 33%. SK Telecom has also joined forces with Nokia and NTT Docomo to expand the scope of testing and validation for "6G AI-Native Air Interface (AI-AI)," which can contribute to further improvements in the performance and energy efficiency of networks.

With a World-class ICT Industry, Taiwan Occupies a Crucial Position in the Supply Chain for FWA-related Products

With the easing of the COVID-19 pandemic, many governments around the world are rolling out broadband subsidy schemes to address the issue of the digital divide. In addition to optical fiber infrastructure, FWA is also expected to play a vital role in rapidly expanding broadband access as it can provide fixed network services through mobile networks. FWA has the advantages of being highly cost-effective and eliminating the deployment of cables. Therefore, it offers the greatest benefit for remote rural communities where network connection costs are high, as well as countries with low broadband penetration rates.

Presently, the US is leading the adoption of FWA, followed by Europe. Since many countries have strict regulations concerning the preservation of historical buildings and other kinds of landmarks, local telecom



COMPUTEX 2024 will be held from June 4th to 7th.

companies have to devise network deployment methods that do not damage or modify building structures or local environments. Moreover, emerging countries, too, are actively investing in the build-out of FWA infrastructure. Examples include the Philippines, India, Vietnam, Indonesia, Mexico, South Africa, and countries in the Middle East.

TrendForce estimates that the shipment volume of 5G FWA equipment reached approximately 7.6 million units in 2022, marking a 111% year-on-year increase. The projected shipment volumes for 2023, 2024, and 2025 are 13 million units, 18 million units, and 22.5 million units respectively, with the corresponding year-on-year growth rates coming to 71%, 38%, and 25%. Additionally, research from Ericsson indicates that by the end of 2021, the number of FWA connections was nearly 90 million. This figure is expected to triple to around 230 million by 2027.

Taiwan has emerged as a global supply hub for FWA-related products, boasting the world's most comprehensive and technologically mature industry chain for networking equipment, optical fiber communication equipment, and semiconductor components. Examples of notable suppliers for telecommunication equipment include Sercomm, Alpha Networks, ZYXEL, Gemtek, WNC, Askey Computer, Arcadyan, and Hitron Technologies. As for Taiwan-based suppliers for products related to fiber optic communication, they include Landmark Optoelectronics, PCL-KY, Apogee, Truelight, and Luxnet. Turning to suppliers for semiconductor components purposed for networking applications, Taiwan's MediaTek has long been a major player. Altogether, these companies are expected to sustain impressive performance.

Local Team Is Being Formed for the Development of LOE Satellites

The Russia-Ukraine military conflict, now entering its third year, has highlighted SpaceX's Starlink as a critical communication technology, sustaining uninterrupted communication links among various units of the

Ukrainian armed forces. The conflict has greatly bolstered the reputation of Starlink and reignited the world's interest in LOE satellites. As early as May 21st, 2021, Taiwan's Executive Yuan approved a plan to promote the development of the "six core strategic industries," including the aerospace sector. The plan prioritizes the development of LOE satellites and related ground equipment. Now, Taiwan's government has provided additional funding of over TWD 40 billion into the field of LOE satellites. Specifically, the government supports the manufacturing of satellites, establishment of a local launch site, and cultivation of industry professionals.

During the 2023 Taipei Aerospace & Defense Technology Exhibition, Wu Jong-shinn, Director General of the Taiwan Space Agency (TASA), announced that Taiwan had initiated its program for the development of orbital launch vehicles. The program aims to launch a 200-kilogram satellite into low Earth orbit by 2023, at altitudes ranging from 500 to 2,000 kilometers above the Earth's surface. Moreover, TASA plans to launch Taiwan's first LOE satellite to support the 5G network in 2026. TRITON (FORMOSAT-7R), Taiwan's first satellite with 83% of its parts locally sourced, was successfully launched in October 2023. This event represents an important milestone in the development of Taiwan's aerospace sector and the related supply chain.

The introduction of LOE satellite communication into the consumer market can be traced back to February 2023 when MediaTek showcased the world's first 5G satellite communication smartphone at MWC. Additionally, Huawei's Mate 60 and Apple's iPhone 14 and Apple Watch Series 8, released in the same year, all feature support for satellite communication. However, the related functionality is limited to either sending emergency messages or SOS emergency services. Nevertheless, AST SpaceMobile subsequently launched the BlueWalker 3 in September 2023, thereby establishing the world's first "direct-to-cell" mobile broadband network. With the integration of terrestrial and non-terrestrial communication technologies under 6G, people will be able to access internet connection

everywhere.

Taiwan-based Companies Involved
in the Development of LOE Satellites

Hardware	Company
Chips	MediaTek
Satellite Antennas	WNC, Universal Microwave Technology, Rapidtek (with Qisda as an investor), TMYTEK, Innolux
Ground Stations	MTI, Auden Techno, ZINWELL, Alpha Networks
HDI, PCB, and CCL	EMC, Compeq, Chin Poon, Unitech
Power Supply Systems	AcBel, Chicony, Hitron Technologies
Routers	WNC, Hitron Technologies

Taiwan Is Building the Most Competitive
Industry Chain for Wi-Fi 7 so as to Seize
Future Demand

Currently, Wi-Fi 6/6E still dominates the wireless network market. However, with the Wi-Fi Alliance releasing Wi-Fi CERTIFIED 7, MediaTek has established a coalition for the creation of a related testing and certification platform. Specifically, MediaTek is assisting its partners such as ASUS, BUFFALO, Hisense, Lenovo, TCL, TP-Link, and others in launching various kinds of devices that support the Wi-Fi 7 standard. The market outlook for Wi-Fi 7 is bright as this new standard brings significant improvements in terms of transmission speed and latency reduction. Apart from being 4.8 times faster than Wi-Fi 6/6E, Wi-Fi 7 has important new features such as multi-link operation (MLO) and multi-resource units that meet the performance demands from various services and applications (i.e., “ultra” with respect to high transmission speed, low latency, and high reliability). Moreover, compared to upgrades between previous generations, there is strong confidence within the market that Wi-Fi 7 will rapidly attain widespread adoption and a higher penetration rate.

In the market for Wi-Fi chips, competition for dominance in the Wi-Fi 7 segment has been heating up since Qualcomm launched the FastConnect 7800, the world’s first Wi-Fi 7 chip, in February 2022. While many chip suppliers are still developing the first generation of Wi-Fi 7 chips, market leader Broadcom sought to outdistance its competitors by launching its second-generation Wi-Fi solutions in June 2023. Broadcom’s second-generation Wi-Fi 7 APs include the BCM6765 for residential networking equipment and the BCM47722 for commercial networking equipment. Following suit, Qualcomm also unveiled its second-generation Wi-Fi 7 chip, the FastConnect 7900, on February 26th of this year. Designed for smartphones, the FastConnect 7900 is the industry’s first solution with a built-in AI engine and is scheduled to hit the market in the second half of this year. Meanwhile, Intel has introduced the BE200, a Wi-Fi 7 module designed for integration with the motherboard of a desktop or laptop PC. Currently, wireless networking cards with the BE200 are now available for purchase. Moreover, various kinds of products and components containing Realtek’s Wi-Fi chips have been released into the market as well. They include Acer’s laptops, Azure Wave’s wireless modules, RichWave’s RF ICs, VPEC’s power amplifier, and networking equipment from WNC, Sercomm, and Senao Networks. Shipments of these end products have been gradually ramping up. All in all, with a plethora of new products hitting the market, 2024 can be regarded as the inaugural year for Wi-Fi 7. TrendForce’s research indicates that after a downturn in 2023, the global market for Wi-Fi chips is projected to reach USD 20.9 billion in 2024, with a year-on-year growth rate of 6.1%. The market is expected to expand further to USD 21.9 billion in 2025, with a year-on-year growth rate of 4.8%. Regarding the market penetration of Wi-Fi 7, devices adhering to this standard accounted for just 1% of total shipments worldwide in 2023. By 2024, this share is expected to increase to 8%; and by 2025, it is forecasted to grow to 18%. According to Wi-Fi Alliance projections, the number of devices with

Wi-Fi 7 will surpass 233 million in 2024; and by 2028, the total number of Wi-Fi 7 products across all categories will surpass 2.1 billion.

COMPUTEX 2024 is scheduled to take place from **June 4th to 7th at the Taipei Nangang Exhibition Center Halls 1 and 2**. With the theme "Connecting AI," this year's exhibition will focus on showcasing the latest global AI technologies and industry trends. The event is expected to attract **1,500** international and local exhibitors, utilizing **4,500** booths across six major areas: AI Computing, Advanced Connectivity, Future Mobility, Immersive Reality, Sustainability, and Innovations. International **visitor registration opens in March**. Visitors from all industries are welcome to participate and experience Taiwan's exceptional AI strength.



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