

## AWARDS CASE STUDY: BEST WI-FI INNOVATION

# BROADCOM LAUNCHES THE INDUSTRY'S FIRST AND MOST COMPLETE ECOSYSTEM OF WI-FI 6E PRODUCTS

### INTRODUCTION

As wireless data usage and the number of wireless devices has increased, and demanding cloud-based applications have proliferated, the wireless industry faced an imminent shortage of unlicensed spectrum. Broadcom mobilized the wireless industry and global regulators and, in parallel, created a complete ecosystem of 6 GHz capable devices for cost-effective delivery of advanced wireless services with significant technology and architectural improvements. Spearheaded by the FCC, regulators around the world, have already or are in the process of permitting use of unlicensed devices in the 6 GHz band, almost tripling the available unlicensed spectrum for use by Wi-Fi devices.

In anticipation of regulatory approval in 2020, Broadcom launched the industry's first lineup of Wi-Fi 6E products for use in mobile phones, routers, gateways and IoT devices. This includes a full lineup of 2x2, 3x3 and 4x4 Access Point Solutions for Enterprise and Residential Segments, enabling companies to build a variety of products that unlock the benefits of the 6 GHz spectrum. Additionally, Broadcom released the world's first Wi-Fi 6E mobile client chipset, the BCM4389, which delivers over 2 Gbps of real-world speeds, low latencies and best-in-class battery life, making it an ideal solution for flagship smartphones and future AR/VR devices.

## DESCRIPTION OF THE CASE

Over the last 20 years, Wi-Fi has evolved from a hobbyist technology in a “junk band” to a global, vital necessity for business and personal applications. Wi-Fi innovation has given individuals more flexibility to work, to be entertained and to connect with friends and family anywhere they are. Wi-Fi is now the “wireless connection of first resort” because of its low-cost, ubiquity, and flexibility.

While each new generation of Wi-Fi has offered users faster speeds, higher capacity, additional frequency bands and faster throughput, user experience has been limited by a developing shortage of unlicensed spectrum. The high growth rate and large install base of Wi-Fi devices, and emergence of new applications such as cloud communications, video-enabled meetings, augmented reality, virtual reality, mobile gaming and unified communications, has and will continue to put stress on existing Wi-Fi deployments. The wireless industry responded to these emerging trends by introducing Wi-Fi CERTIFIED 6 in 2019. Based on the IEEE 802.11ax amendment, Wi-Fi 6 introduces features to improve Wi-Fi performance in crowded, congested environments. These features, coupled with the innovative branding of the 6th generation of Wi-Fi, led to the unprecedented market success of Wi-Fi 6. Adoption was widespread across the industry with over 150 million units shipped in 2019 alone. However, it became evident that additional spectrum was still needed to keep up with exploding demand and the 6 GHz band was a natural candidate for the next generation of Wi-Fi.

The 6 GHz band has numerous deployment advantages for Wi-Fi technology. First, it is a relatively uncongested 1200 MHz-wide band where wider channel bandwidths can be employed to support demanding high-throughput, low-latency applications. Migration of the most demanding applications to the 6 GHz band will also free up legacy frequencies and improve performance of existing device deployments by reducing congestion. For example, the availability of up to seven non-overlapping 160 MHz channels, or 60 additional 20 MHz channels will revolutionize how 5G indoor and dense urban networks are deployed. Second, the 6 GHz band is adjacent to the existing 5 GHz Wi-Fi band. This reduces the incremental cost of adding 6 GHz capability to devices that already support Wi-Fi in the 5 GHz band. Third, the propagation characteristics of radio signals in the 6 GHz bands are similar to those in 5 GHz, making upgrading existing equipment easier.

To realize its vision of bringing Wi-Fi to the 6 GHz band, Broadcom and its industry partners worked hand-in-hand with global regulators to demonstrate how the 6 GHz band could be shared to deliver advanced wireless services without harming incumbents. This was achieved by conducting multiple studies, investing in new technologies and creating real-world demonstrations to help regulators make informed technical decisions. In response to Broadcom's petitioning, regulators worldwide have made additional unlicensed spectrum available in the 6 GHz band. The United States led the world by deploying 1200MHz of spectrum for low-power indoor use and 850MHz for outdoor use under control of Automatic Frequency Coordination systems. As the FCC considers low-power portable device operation in the 6 GHz band, similar regulatory progress is underway in multiple jurisdictions, notably the UK, South Korea, Chile and others. Broadcom also marshalled the industry under the umbrella of the Wi-Fi Alliance to create the Wi-Fi 6E certification program, which ensures interoperability and a high standard of quality and functionality. Wi-Fi CERTIFIED 6E brings all the compelling features of Wi-Fi 6 to the 6 GHz band and is expected to launch in December 2020.

## SOLUTIONS

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Additionally, Broadcom released the world's first Wi-Fi 6E mobile client chipset, the BCM4389, which delivers over 2 Gbps of real-world speeds, low latencies and best-in-class battery life, making it an ideal solution for flagship smartphones and future AR/VR devices. To deliver this performance without compromising battery life, Broadcom created a novel Tri-band Simultaneous (TBS) architecture in a leading-edge semiconductor process node. TBS improves on today's Simultaneous Dual Band architecture, which was pioneered by Broadcom in 2017 and is employed on virtually all high-end mobile phones. TBS adds an independent low-power scan radio that optimizes Wi-Fi and Bluetooth performance by scanning for and avoiding potential sources of interference in the background.

## IMPACTS TO PEOPLE AND INDUSTRY

Every market segment and use case benefits from the Broadcom 6 GHz ecosystem. In the home, with multiple generations of Wi-Fi devices, and a variety of wireless applications, people can successfully track fitness, stream movies, control thermostats and more, all while maintaining good connectivity. Wi-Fi 6E handles different types of traffic from multiple users simultaneously, gives users higher throughput, and extends device battery life to enable new use cases and enhance existing ones.

In the enterprise, Wi-Fi 6E brings deployment of wider channel bandwidths to increase network capacity. Enterprises can upgrade existing networks to deliver cloud-based communication and collaboration tools without capacity limitations. Similarly, crowded venues like train stations, airports, shopping malls, and stadiums will get up to 60 new channels to increase capacity.

For Industry 4.0 and IoT uses, Wi-Fi 6E reduces battery power consumption by employing the Target Wake Time (TWT) feature of Wi-Fi 6, which allows devices to sleep when they are not required to communicate. There are also improvements in overhead reduction, advanced scheduling algorithms and robust outdoor operation.

## CONCLUSION

Broadcom's ecosystem of Wi-Fi 6E solutions enables customers to take full advantage of new worldwide unlicensed spectrum and the advanced features of 6th-Generation Wi-Fi. Wi-Fi 6E will enable wireless innovation and growth of Wi-Fi connectivity for years to come.