

# APEX STANDARDS

## Chinese Greentooth (NearLink) vs International Bluetooth

The US sanctions against Huawei in 2019 marked a turning point in the global technology landscape, particularly impacting wireless communication. These sanctions led to Huawei's exclusion from international standardization groups like the Bluetooth SIG, sparking a push towards technological self-reliance in China. Huawei's response was the development of its own near-range wireless communication technology, initially known as Greentooth and later rebranded as NearLink under the SparkLink Alliance.

This August, Huawei's launch of the Mate 60, its first major smartphone since the Honor split, and the MatePad Pro 13.2 with NearLink technology, highlighted its shift towards self-reliance. Selling 1.6 million Mate 60 Pro units in six weeks, Huawei declared a "high-end smartphone renaissance." Remarkably, 400,000 of these were sold in just two weeks, overlapping with Apple's iPhone 15 launch in China, where it experienced a 4.5% sales decrease compared to the iPhone 14, emphasizing the Mate 60 Pro's market appeal.

NearLink delivers strategic advantages, surpassing Bluetooth's reliance on dated techniques. It incorporates cutting-edge 5G innovations including advanced antennas, improved multiplexing, HARQ, more MIMO streams, built-in support for DTX/DRX, and faster ZUC security algorithms, considerably enhancing power efficiency, capacity, and latency, and therefore equipping it to handle a diverse range of IoT devices effectively. Such versatility makes it suitable for various applications, from consumer electronics to smart homes and industrial uses.

The development also signifies a shift in the global power play, reflecting China's determination to standardize its technologies and reduce reliance on Western-led ecosystems. This trend towards technological bifurcation is evident in China's speedy advancements in 5G/6G and now NearLink, marking a new era in China's tech landscape.

NearLink's challenge lies more in geopolitics than technology. There are concerns about NearLink potentially being used for surveillance by the Chinese government. This may hinder its global adoption, mirroring the West's efforts to exclude Huawei from 5G infrastructure. Nevertheless, Huawei's pursuit of a self-reliant technology pathway signals a decoupling in US-China technology relations and a departure from international standardization processes, where the corporate West may favor the status quo and hinder progress.

Contrasting with 3GPP, managed by ETSI in France and part of Europe's leadership in global standardization including the ISO in Switzerland, the US-based Bluetooth and China's Greentooth represent a direct competition. Amid US pressures, the emergence of the China-exclusive wireless standard, spearheaded by Huawei and Chinese firms, introduces the prospect of a parallel form of networking—closed and insular. This challenges traditional monitoring and influence from the West and prompts critical considerations for governments and multinational companies.

Huawei's NearLink, evolving from conceptual Greentooth to commercial success in just two years, marks China's technological ambition. It also stresses a change that persists irrespective of external factors, reshaping the global tech landscape enduringly and profoundly.

	NearLink (Greentooth)	Bluetooth
Logo		
Naming	In its early-stage development, NearLink was initially known as "Greentooth." Subsequently, it received formal definition and establishment by the SparkLink Alliance. The prefix "Green" highlights its distinct, pioneering energy-efficient technologies, setting it apart from the existing international standard, "Bluetooth."	Named after King Harald "Bluetooth" Gormsson, a symbol of unifying tribes, highlighting its role in enabling interoperability and connectivity among diverse devices.
Since	2020	1998
Source URL	www.sparklink.org.cn	www.bluetooth.com
Standardization Organization and Headquarters	SparkLink Alliance - 星闪联盟 Headquarters: Beijing, China	Primary: Bluetooth Special Interest Group (SIG) Headquarters: Kirkland, Washington, United States IEEE 802.15.1 Personal Area Networks (PANs) Headquarters: Piscataway, New Jersey, United States
Initial Key Persons	万蕾 Wan, Lei / Huawei 华为技术有限公司 王志勤 Wang, Zhiqin / CAICT 中国信息通信研究院 张晓刚 Zhang, Xiaogang / Former President of International Organization for Standardization (ISO) 国际标准化组织	Nils Rydbeck, Johan Ullman, Örjan Johansson / Ericsson Adalio Sanchez / IBM Stephen Nachtsheim, Jim Kardach / Intel
History	Huawei takes the lead in forming the SparkLink Alliance, a consortium comprising 300 tech companies, predominantly Chinese, with exceptions like MediaTek from Taiwan and Saint-Gobain from France. Notably, major US players such as Intel, Qualcomm, AMD, and Nvidia are notably absent, suggesting the potential for NearLink's success in China. However, alternatives like Apple's ultra-wideband (UWB) technology for devices, including the new iPhone 15 series, also compete. Despite Huawei's backlisting in the US, it maintains a substantial global presence.	Bluetooth technology emerged in the 1990s through collaboration between key individuals and companies. Intel engineer Jim Kardach, along with Ericsson engineers Sven Mattisson and Jaap Haartsen, played vital roles. The name "Bluetooth" was inspired by King Harald Bluetooth of Denmark, known for uniting people. Ericsson's launch of a Bluetooth wireless headset prototype in 1998 marked a milestone. The Bluetooth Special Interest Group (SIG) formed, leading to the development of a universal wireless standard that revolutionized device connectivity.
Member Companies	SparkLink Alliance member companies include Huawei and STMicroelectronics, Triductor, Sylincom, Melexis, Huawei, and Zhejiang Shengyan in UE vendors, Beijing Sylincom and TCL in smart homes, Triductor in smart manufacturing, and automobiles, such as BYD, Chang An Auto, Geely, SAIC, Dongfeng, BAIC, and Guangzhou Pinzhong Electronic Technology (Beitong) in UAV. Lenovo, ZTE, and Haier also contribute across industries, including smart appliances and automobiles.	Major companies in Bluetooth standardization include Apple, Qualcomm, Intel, Microsoft, Samsung, Ericsson, Toshiba, Nokia, Panasonic, Sony, and IBM, while Chinese firms like Huawei, Xiaomi, Lenovo, Vivo, Oppo, and OnePlus also contribute to the Bluetooth Special Interest Group.
Commercial Products	Huawei Mate 60, MatePad Pro 13.2, and Freebuds Pro introduced on August 29, 2023.	Bluetooth technology is integral to a wide range of modern devices since early 2000s, including smartphones, tablets, wireless headphones, smartwatches, smart homes, automobiles, and healthcare devices.

Head-to-Head Specification Comparison		
	NearLink 1.0 (November 2022)	Bluetooth 5.3 (May 2022)
1 Latest Version	Distributed with management (G) and managed (T) nodes	Host/Controller architecture with layers: HCI, L2CAP, GAP, GATT
2 Architecture	Time Division Duplexing (TDD)	A combination of time-division duplex (TDD) and frequency-hopping spread spectrum (FHSS)
3 Duplexing Method	20/40/60/80/100/160/320 MHz (a maximum of 16 channels for a total of 320MHz bandwidth, each 20 MHz wide)	2.4 GHz (79 channels, each 1 MHz wide)
4 Bandwidth Options	QPSK, 16QAM, 64QAM, 256QAM, 1024QAM	Gaussian Frequency-Shift Keying (GFSK) modulation, Phase-Shift Keying (PSK), or 8-Differential Phase-Shift Keying (8DPSK) pending on specific implementation
5 Modulation Schemes	Polar and RS coding	Forward Error Correction, Cyclic Redundancy Check, ARQ, Adaptive Frequency Hopping
6 Channel Coding	Orthogonal Frequency Division Multiple Access (OFDMA), widely used in Wi-Fi (IEEE 802.11a/g/n/ac), and 3GPP 4G-LTE/5G-NR.	Traditional Time-Division Multiplexing (TDM)
7 Multiplexing Method	Fine-grained synchronization, precision < 1 μs	Adaptive Frequency Hopping, Clock Synchronization, and Slot Timing, with synchronization precision within 1-10 μs
8 Synchronization	Ultra-low, < 20 μs for unidirectional transmission	Classic 100,000 μs; Low Energy (BLE) 6,000 μs.
9 Latency	Block Error Rate (BLER) < 0.001%	Block Error Rate (BLER) < 0.1%
10 Reliability	CP-OFDM	Frequency-hopping, GFSK-modulated signal bursts
11 Waveform	Supports both standard and extended cyclic prefix	Packet-based, time-slotted, synchronous transmission.
12 Frame Structure	Hybrid ARQ with Chase Combining and Incremental Redundancy options	No HARQ; uses simpler ARQ
13 HARQ Support	Strong authentication and encryption, including dynamic key management	Encryption, authentication, frequency hopping, pairing, authorization.
14 Security Structure	920 Mbps for G Link, 460 Mbps for T link (20 MHz bandwidth)	3 Mbps for Classic at 2.4 GHz
15 Peak Data Rate	Supports high concurrency, e.g., 35 real-time audio streams	3 real-time audio streams
16 Concurrency	Subcarrier spacing of 480 kHz	Bluetooth channel spacing is typically 1000 kHz (or 1 MHz) for most of its applications, with an option for 2000 kHz (or 2 MHz) in certain Bluetooth 5.0 configurations.
17 Subcarrier Design	20.833 μs per wireless frame	625 μs per wireless frame
18 Frame Duration	Pioneering techniques for managing inter-domain interference	Matured frequency hopping and adaptive channel selection methods
19 Interference Mgmt.	Frequency and time domain resource allocation for different services	Dynamic frequency hopping, time-slotted, based on master's control.
20 Resource Allocation	With energy efficiency considerations at its core, the design harnesses advanced 5G technologies, boasting built-in, dual-mode Discontinuous Transmission (DTX) and Discontinuous Reception (DRX) functionalities, making it exceptionally capable of managing massive connected devices	Short burst communication and power-saving modes akin to DRX (Discontinuous Reception) in cellular networks
21 Energy Efficiency	Strong two-way authentication using PSK	Strong two-way authentication using PSK
22 Authentication	Two types for different latency and reliability needs	SCO for low-latency audio and ACL for reliable data
23 Data Transmission	Hybrid ARQ (HARQ) for enhanced throughput and reliability compared to traditional ARQ	Traditional ARQ
24 ARQ Performance	32 levels, ensuring smooth throughput performance across different channel conditions	LE 1M PHY: Standard, balanced range and speed. LE 2M PHY: Higher speed, shorter range. LE Coded PHY (S=2 and S=8): Extended range, lower speed.
25 MCS Range	48 wireless frames with configurable symbols for efficient data transmission	18 time slots
26 Super Frame	Two types of training signals for synchronization	Three types of training signals: 0x00, 0x55, 0xC6
27 Synchronization	Versatile MIMO configurations for both G (up to 8 streams) and T (up to 4 streams) nodes	2x2 MIMO for both G (General) nodes (up to 2 streams) and T (Transmit) nodes (up to 2 streams)
28 Antenna	Supports ZUC and AES algorithms with 256-bit symmetric keys; ZUC is optimized for high-speed data encryption commonly used in mobile telecommunications	AES-CCM for encryption and decryption with 128-bit keys. Also supports the AES-CMAC with 128-bit keys. Advanced ZUC is not a part of Bluetooth's security algorithms.
29 Security Algorithm	Incorporating cutting-edge technologies, further advancements in efficiency and lower power consumption, with broader bandwidth, more antennas, and rapid expansion from wearables and sensors into the automotive sector, leveraging China's unique advantages	Enhanced IoT integration, improved location services, increased data speeds, security and energy efficiency improvements, and expanded roles in healthcare and mesh networking
30 Future Evolution Prospects		

**Significant Technological Leap:** yellow highlights show Greentooth's advanced specifications, like OFDM (7 & 11), HARQ (24), enhanced antennas (28), and rapid ZUC security (29), all inspired by the latest 5G innovations and China's rising 5G prominence. These features far surpass current Bluetooth implementations and collectively place Greentooth at the forefront with a notably higher data rate (15), reduced latency (9), enhanced reliability (10), and superior energy efficiency (21), as indicated in orange. This illustrates SparkLink's commitment to not just embracing but actively implementing cutting-edge technologies, redefining industry standards.