GSMA

6G:
A new network that can see, hear and think

Introduction: 40 years of SIM-card evolution

Mobile communication technology completes a generational leap around every ten years, with each generation redefining the way people connect with the world.

In 2009, 4G LTE began commercial deployment, and the prevalence of mobile broadband made smartphones deeply embedded in our daily lives — WeChat, online shopping, mobile payments — these are products of the 4G era. 10 years later, 5G began to roll out in major markets worldwide. Unlike 4G's Internet of People, 5G shifts its focus to the Internet of Everything: low latency and high reliability make industrial automation, vehicle networks and remote control possible, marking the first time mobile networks have penetrated from consumer internet to industrial internet.

By the end of 2024, **global 5G connectivity surpassed 20 billion, and it is estimated that by 2030, it will account for 57% of global mobile connectivity.** [1] Mobile technology contributed approximately 5.6 trillion USD to the global economy in 2024, and it is estimated to increase to 11 trillion USD by 2030. [2] 5G's scale effect is far from reaching its peak.

Just as 5G is still in full expansion, the research window for the next technological revolution has already opened. **The International Telecommunication Union (ITU) has officially named 6G as "IMT-2030", aiming to enter the commercial deployment stage in 2030.** Understanding how 5G and 6G can advance in parallel is an issue that technologists cannot ignore.

The evolutionary logic from 5G to 6G

5G has demonstrated its potential for transforming mobile network services in vertical industries. Enhancing mobile broadband (eMBB), ultra-reliable low-latency communication (URLLC) and massive machine-type communication (mMTC) are being promoted at different paces in various global markets, laying an important foundation for the evolution of 6G.

6G is not a negation of 5G, but a natural extension beyond it. Huawei's 6G: The Next Horizon defines 6G as: "A distributed neural network that will provide communication pathways for integrating the physical, digital and biological worlds, truly opening a new era of intelligent connectivity of everything. "[3]

6G's new capabilities: sensing and AI

While connectivity continues to improve, 6G will introduce two important new capabilities: Integrated Sensing and Communication (ISAC) and native AI.

Traditionally, radar is responsible for sensing, and communication networks deal with data transmission, each performing its duties. **ISAC will integrate the two**: while transmitting communication signals, **6G base stations will use the reflection, refraction and scattering of wireless waves** to scan the surrounding environment in real-time, gaining sensing capabilities such as positioning, environmental reconstruction and monitoring, gesture and behaviour recognition. This feature is expected to **change the deployment logic of infrastructure** in smart cities, **industrial manufacturing** and **autonomous driving**, eliminating the need for additional dedicated sensing equipment.

At the same time, **AI will transform from an external tool to an intrinsic component of the network.** 6G will build a deep- edge intelligence architecture, allowing distributed machine learning to migrate from the cloud to the network edge and terminals. Networks will no longer be just data transmission channels, but active systems involved in reasoning and decision making.

2035 vision: terminals, scenarios and possibilities

The value of technology ultimately returns to human experience. Humanity is already enjoying the convenience brought by the 5G era's Internet of Everything, **while 6G is expected to lead us into an era of intelligent connectivity of everything,** where the physical and virtual worlds merge.

The GSMA released the 6G Terminal Vision White Paper, depicting a 6G-era lifestyle. Picture this: wearing XR headsets, you enter a 360-degree immersive gaming competition, sensors capture your movements and physiological indicators in real-time. When shopping, virtual fitting rooms recommend styles based on your body data, and after confirmation, drones deliver the clothes to your door. When travelling in remote areas, autonomous vehicles plan routes based on real-time road sensing, while you complete remote meetings in the car, experiencing no difference from being in the same room with the person. In the operating theatre, doctors view the patient's internal structure through the XR interface and perform precise operations with remote-controlled robotic arms, and city managers simulate every physical decision in the city's digital twin image before implementing them. [4]

The realisation of these scenarios relies not only on the leap in network capabilities but also on the fundamental transformation of the role of terminal devices. In the 6G vision, the core capabilities of terminals will encompass four major directions:

- **Omni-communication** - supporting higher speeds, lower latency and multi-mode access, integrating sky and earth.
- **Intrinsic intelligence** - running large models locally on terminals, completing reasoning and personalised decision making without relying on the cloud, while ensuring user data does not leave the terminal.
- **Virtual and full-scenario sensing and multi-sensory presentation** - collecting and presenting multi-sensory information from vision and hearing to touch and smell, breaking the existing 2D information interaction boundary.
- **Expanded collaboration** - terminals breaking the closed structure of single devices, collaborating flexibly with surrounding devices, network side and cloud side as needed, expanding sensing and computing capabilities. [4]

Spectrum: the battle for 6G infrastructure

Regardless of what form 6G ultimately takes, spectrum resources are the essential physical requirement for its realisation. The wider the channel, the greater the data volume the network can carry and the higher the spatial and motion sensing resolution – low-latency applications also require wider channels to avoid congestion.

On the demand-data layer, global mobile network capacity needs will continue to grow at an annual rate of **15–20% over the next five years**; the traffic per square kilometre in ultra-high-density urban areas is typically more than nine times that of other urban areas and more than 650 times that of rural areas. Therefore, **between 2035 and 2040, global high-density areas will require an average of 2–3 GHz mid-band spectrum, with the densest urban areas potentially requiring up to 4 GHz.** [5]

This is why the 7–8 GHz band has become the core contention in 6G planning for various countries. The 2027 World Radiocommunication Conference in Shanghai (WRC-27) will be a milestone, where parties will discuss the allocation of key bands, such as 7.125-8.4 GHz.

Global layout: standard setting and progress

The potential of 6G has garnered widespread attention from major global economies, but what's key to this revolution advancing is a unified international standard framework.

The EU has established a task force through its Radio Spectrum Policy Group (RSPG) to **develop a 6G strategic vision and plans to deliver a 6G spectrum roadmap by 2027**, which will identify which frequency bands are best suited for the 6G era. India is advancing its 6G research plan through the Bharat 6G Alliance, while the UAE regulatory body TDRA has released its 6G Roadmap and Saudi Arabia is promoting 6G research and development through government-university cooperation.

It’s important to note that these processes share a common logic: first fully exploiting the commercial potential of 5G, then reinvesting the returns from 5G into 6G research and development, to achieve sustainable industrial chain development.

China is one of the typical practitioners of this strategy. The country has built 4.55 million 5G base stations, with 5G mobile users reaching 1.12 billion in June 2025; [6] by 2030, China's 5G connections are expected to account for nearly one-third of the global total. [1] Meanwhile, **China has included 6G in its 14th Five-Year plan, setting a commercial target for 2030 and ranking first in the world for 6G patent applications – with 40.3% of the global share.** [6] The Ministry of Industry and Information Technology has completed the first phase of 6G technology trials, achieving over 300 key technological results, and is currently entering the second phase. [7]

Behind the active deployment by all parties is a consensus: the value of 6G can only be fully realised under a globally coordinated standard framework.

Discover how 6G will move towards standardisation at MWC26 Shanghai

Each generation of network technology has spawned new economic forms that were previously unimaginable. **6G envisions a world of network proactive perception and thinking, and digital twins reflecting real-time physical reality - representing the most imaginative technological leap forward to date.** However, to achieve this leap, the technology must be built on globally unified standards. If the next neural network of the perceptual world is fragmented from the start, the digital twin civilisation it constructs, will also be fragmented. [8]

These discussions will be a key focus at this summer’s **MWC26 Shanghai.** Taking place from **24–26 June 2026**, it is Asia’s largest and most influential connectivity event. New this year is a dedicated 6G Zone[9], offering technology practitioners a valuable opportunity to observe how 6G is progressing from the lab towards standardisation.

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