5G

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In telecommunications, 5G is the fifth generation technology standard for cellular networks, which cellular phone companies began deploying worldwide in 2019, the planned successor to the 4G networks which provide connectivity to most current cellphones.[1] Like its predecessors, 5G networks are cellular networks, in which the service area is divided into small geographical areas called cells. All 5G wireless devices in a cell are connected to the Internet and telephone network by radio waves through a local antenna in the cell. The main advantage of the new networks is that they will have greater bandwidth, giving higher download speeds,[1] eventually up to 10 gigabits per second (Gbit/s).[2] Due to the increased bandwidth, it is expected that the new networks will not just serve cellphones like existing cellular networks, but also be used as general internet service providers for laptops and desktop computers, competing with existing ISPs such as cable internet, and also will make possible new applications in IoT and M2M areas. Current 4G cellphones will not be able to use the new networks, which will require new 5G enabled wireless devices.

The increased speed is achieved partly by using higher-frequency radio waves than current cellular networks.[1] However, higher-frequency radio waves have a shorter range than the frequencies used by previous cell phone towers, requiring smaller cells. So to ensure wide service, 5G networks operate on up to three frequency bands, low, medium, and high.[3][1] A 5G network will be composed of networks of up to 3 different types of cell, each requiring different antennas, each type giving a different tradeoff of download speed vs distance and service area. 5G cellphones and wireless devices will connect to the network through the highest speed antenna within range at their location:

Low-band 5G uses a similar frequency range as current 4G cellphones, 600 - 700 MHz giving download speeds a little higher than 4G: 30-250 megabits per second (Mbit/s).[3] Low-band cell towers will have a similar range and coverage area to current 4G towers. Mid-band 5G uses microwaves of 2.5-3.7 GHz, currently allowing speeds of 100-900 Mbit/s, with each cell tower providing service up to several miles radius. This level of service is the most widely deployed, and should be available in most metropolitan areas in 2020. Some countries are not implementing low-band, making this the minimum service level. High-band 5G currently uses frequencies of 25 - 39 GHz, near the bottom of the millimeter wave band, although higher frequencies may be used in the future. It often achieves download speeds of a gigabit per second (Gbit/s), comparable to cable internet. However millimeter waves (mmWave or mmW) only have a limited range, requiring many small cells. They have trouble passing through some many types of walls and windows. Due to their higher costs, current plans are to deploy these cells only in dense urban environments, and areas where crowds of people congregate such as sports stadiums and convention centers. The above speeds are those achieved in actual tests in 2020, speeds are expected to increase during rollout.[3]

The industry consortium setting standards for 5G is the 3rd Generation Partnership Project (3GPP).[1] It defines any system using 5G NR (5G New Radio) software as "5G", a definition that came into general use by late 2018. Minimum standards are set by the International Telecommunications Union (ITU). Previously, some reserved the term 5G for systems that deliver download speeds of 20 Gbit/s as specified in the ITU's IMT-2020 document.

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