

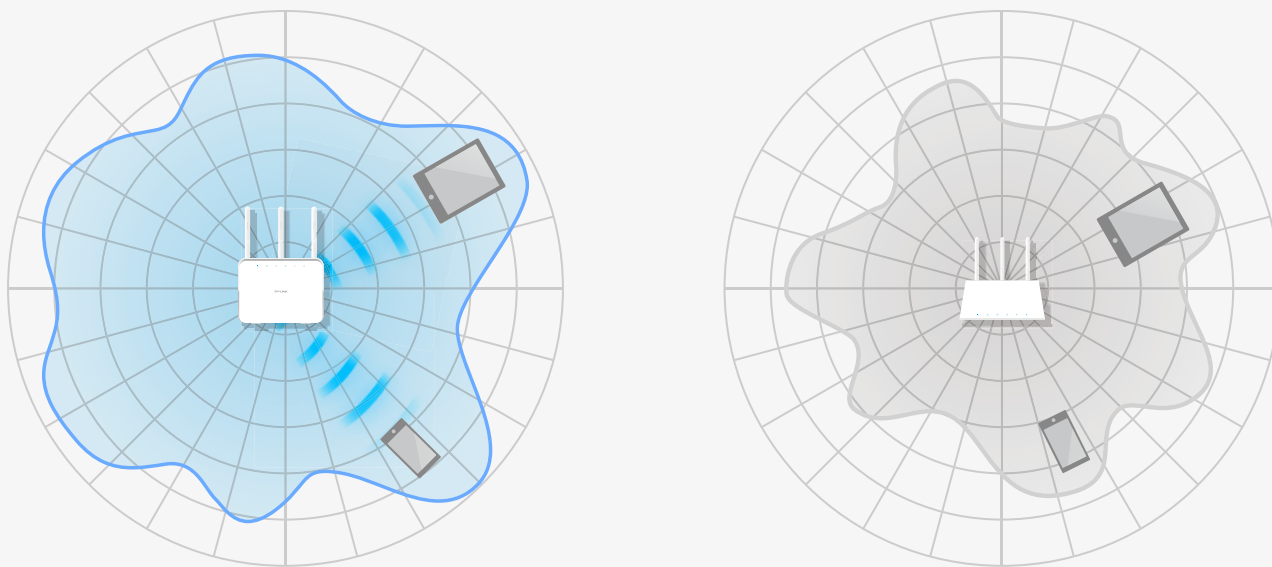
What is beamforming technology?

Inevitable Interference

You may ever try this, throw a stone into a lake, there will be waves spreading out toward. If you throw another stone, the two kinds of waves will overlap. What's worse, if you throw more stones, those circular waves will be broke because they interfere each other. This is like nowadays wireless interference: so many wireless devices (wireless routers or access points) spreading signal in all area, and these signals are like waves interfering each other. Then your internet connection will be unstable, which will bring problems.

Beamforming Technology

In order to reduce wireless interference and improve the reliability of Wi-Fi signal, the 5th generation Wi-Fi standard 802.11ac adapts an effective technology, named beamforming. Beamforming can transmit data towards directions of given clients, instead of radiating data in all directions. Someone makes a metaphor: beamforming is like a laser, which can deliver data directly to specific devices, while previous wireless is like a light bulb spreading light (data) in a set of area. A laser can focus its power, so it can reach farther. Similarly, beamforming technology provides wider coverage.



The Logic of Beamforming Technology

Technically speaking, beamforming technology is based on digital signal processing (DSP) logic and MIMO technology. Beamforming can determine the right direction of the given client device. To do this, a beamformer (transmitter) changes the phase and relative amplitude of the signal. It can create a constructive interference and destructive interference, making the signal in wanted direction stronger and others weaker. 802.11ac beamforming technology takes advantage of the MIMO (multiple-input and multiple-output) system, in which the signals sent by separate antennas can be combined to produce a stronger one. As for how to decide the changed phase, it's a mathematical procedure, called channel calibration or channel sounding procedure.

802.11ac beamforming is based on channel sounding procedure, to choose the right direction. It goes this way: the transmitter send a NDP(Null Data Packet) Announcement frame to the receiver, when the receiver get the NDP it will analyzes and calculates a feedback matrix to the transmitter. Then the transmitter accepts and calculates the steering matrix according to the received feedback. This steering matrix can adjust the phase and amplitude of the signal, so the transmitter can transmit data toward right directions. So in the right directions, the signals get stronger and in other directions the signals get weaker, ensuring the energy is used in the most efficient way.