

Carrier Sense Multiple Access/Collision Avoidance

In normal 802.11 network configurations, all stations apply a standard mechanism to avoid collision of wireless messages. The carrier cannot detect if a collision has occurred, so it attempts to avoid collisions by waiting for the wireless medium to be clear for the amount of time it takes for a packet to propagate through the entire medium (i.e., for a packet to be sent from the station farthest away).

When a 802.11 device intends to transmit a message, it will first sense whether another station is already transmitting (Carrier Sense). If no other transmissions are sensed, the 802.11 device will send a small request-to-send (RTS) packet to its intended recipient. If the recipient senses that the medium is clear, it sends a clear-to-send (CTS) packet in reply. Once the station wishing to transmit receives the CTS packet, it sends the actual data packet to its intended recipient. If the transmitting station does not receive a CTS packet in reply, it begins the RTS procedure over again. If an IEEE 802.11 device does sense another transmission when it wants to send, the device will apply a random deferral timer. After the timer has expired it will start sampling the medium again to see if it can start transmitting.

In many environments this protocol is sufficient to greatly reduce collisions and somewhat increase bandwidth utilization. Often, the user of a wireless computing device may hardly notice the deferral behavior of the 802.11 radio. However, this free-for-all deferral behavior does not completely solve the hidden node problem, in which the stations farthest away from each other cannot 'hear' each others' packets quickly enough, because the time it takes for a packet sent from one station to reach the second station is greater than the second station's wait time.