Frequency Domain Contention

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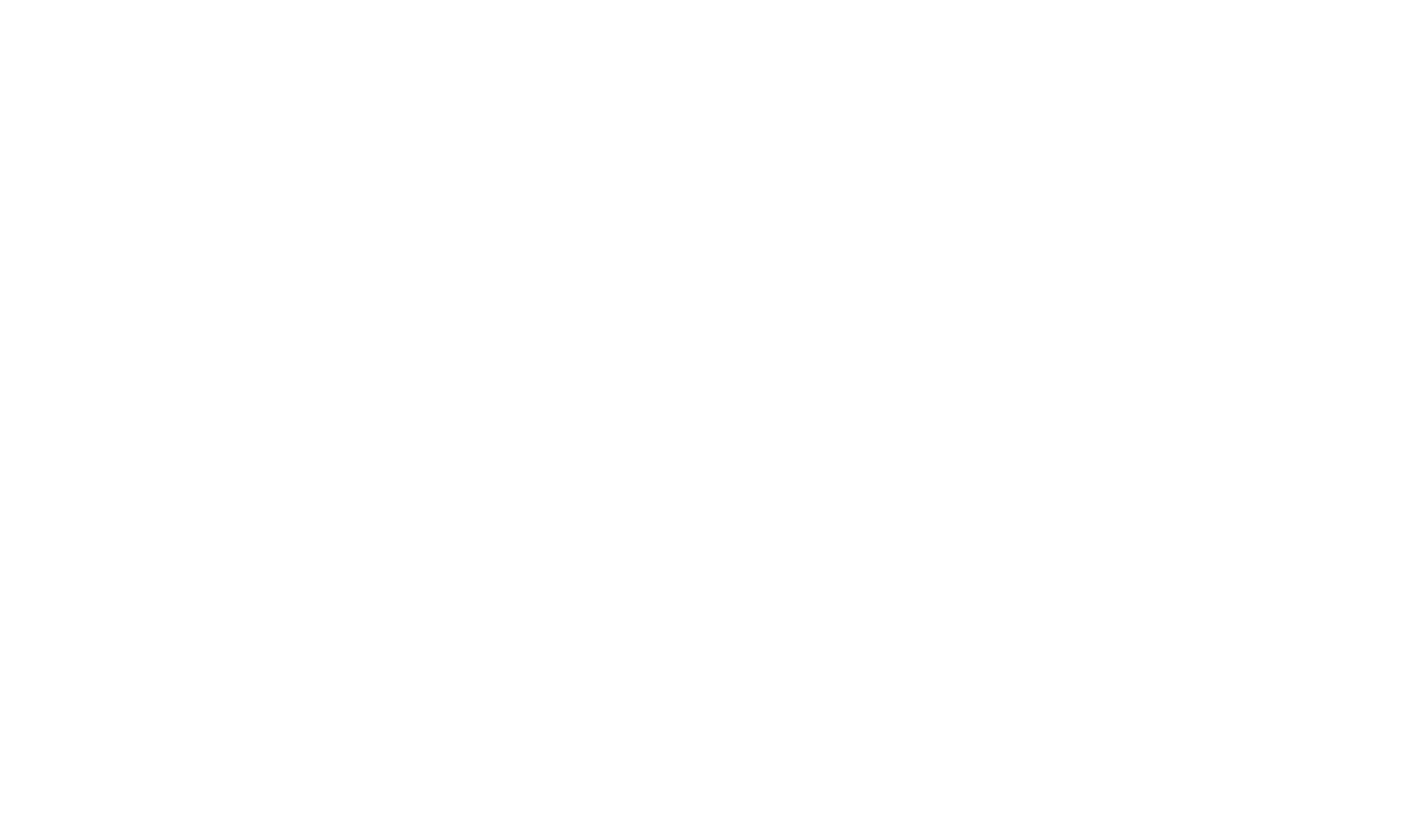
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One of the biggest issues with distributed MAC protocols, both DCF and EDCA, is that a huge amount of time is wasted just to **avoid conflicts**. We have seen the different types of waiting times in the form of **interframe spaces**. For example, suppose there are three stations, which pick the random numbers 3, 5, and 9. Thus, for the first 3 slots, nothing is happening in the medium. This is wasted time. If we could somehow instantly notify every station in the channel about the lowest number picked at the very beginning, this wastage could be avoided.

This exact solution can be implemented using **frequency domain contention**.

## Orthogonal Frequency Division Multiplexing

In traditional frequency division multiplexing, channels cannot overlap and different channels using the same frequency must be separated from each other. However, in **Orthogonal Frequency Division Multiplexing**, different frequency channels can overlap. This helps **save bandwidth**.



Even though all the signals from the different channels are combined into one, called a **composite signal**, each of the subcarriers can be **separately received** and processed by antennas.

## Communicating Between Stations

We can utilize the properties of the OFDM subcarriers to reduce the amount of time we are wasting. For each possible number, a **separate subcarrier** exists. Each station transmits a voltage on the subcarrier corresponding to the number it has picked. For example, if a station picks the number 3, it transmits a high voltage on the third subcarrier.

All the stations do this at the **same instance of time**, which reduces the time wasted in choosing the winning station dramatically. At the same time, all the stations are **receiving** the composite signal as well, so that each station knows whether or not it won the contention. To be able to transmit and receive at the same time, this method requires each station to have a **dual antenna**.