Why Use Polling MAC?

SHORTCOMINGS OF WI-FI SCALABILITY IN MULTIPOINT AND REMEDIES

Problems with Wi-Fi

Built around IEEE standards, the Wi-Fi market has been a spectacular success in the last decade and continues to enjoy steady growth. Started as a optional replacement for wired LAN, Wi-Fi had gotten into all types of devices, from laptops to smartphones to even TVs and refrigerators. To put it in numbers, the chipset shipment is expected to reach 1B units per year and there is no sign of that slowing down at this time.

Using this success as a platform, there have been attempts to extend Wi-Fi for outdoor multipoint network applications, but a seamless extension of 802.11 Wi-Fi has met with significant problems. The primary culprit is the contention-based MAC protocol, namely CSMA (Carrier Sense Multiple Access). Though a node is supposed to detect the absence of other traffic prior to transmission, it is essentially a protocol exposed to packet collisions, which are corrected by the retry mechanism, i.e. a reactive measure rather than preventive. Such an architecture has led to a simple, low cost implementation of the WLAN solution and does work well in the majority of applications where the network usage pattern is relatively light and devoid of burst traffic.

This is often not the case in the outdoor multipoint applications for the following two reasons:

Congested Networks

Some networks are designed to be heavily used, almost to the full capacity eventually over time. In a light CSMA network usage situation, a small amount of contention can be tolerated and the user will not notice a problem. If a CSMA network is used heavily, the efficiency at the base station degrades significantly in its effort to handle a high number of access requests from client units. The total available network capacity is then reduced as a function of the client unit count. Likewise, the traffic latency increases significantly at the same time. Cases in point are the following two applications:

1. Wireless ISP networks—The network may work just fine with the first 10 clients. In a CSMA network, the network efficiency and thus the total network capacity will get reduced as the ISP expands to put more clients. ISPs need to have both a large network capacity to a large number of clients per sector in order to be competitive in the market.

2. Video Surveillance Networks—Video networks demand large capacity for two reasons. The latest network camera is now being equipped with high-resolution capabilities, some with the HD resolution. Also, video surveillance networks by nature need to handle constant image streaming, as opposed to ISP applications where the traffic pattern is bursty and variable per subscriber. In such constant traffic applications, network administrators should expect network congestion to occur anytime, 24 hours and 7 days.

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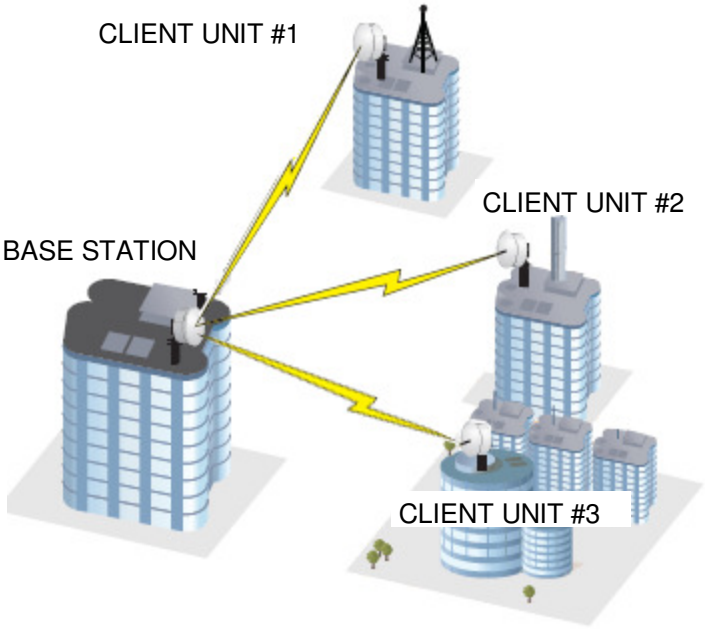
The Answer: Polling MAC

In order to solve these issues, Solectek has implemented its own MAC design, PPMTM (Polling Protocol for Multi-point). In a PPM network, the base station controls network access to its client units, one-by-one, and "polls" each client unit in a round-robin manner. In this regard, there is no possibility for contention; client units are given chances to transmit and receive packets in an orderly manner, all controlled by the base station.

Polling MAC advantages will not be apparent for a small network with a few subscriber units. As the network grows in terms of traffic amount or number of subscriber units, polling MAC will have the advantage. Typically, Wi-Fi networks will degrade as the number of subscriber units exceeds 10 units under reasonable amount of traffic load and experience more severe degradation as the number reaches 20 or higher. Solectek PPM Polling MAC is designed to support much higher count of subscribers with little performance degradation.

Whether the customer is an ISP or a network provider for bandwidth hungry applications, the question of scalability must be one of the critical criteria in choosing a system. Solectek PPM answers this question upfront and will protect the network performance for years to come.



HOW POLLING MAC WORKS:

Base Station will open up a time window for Client Unit #1 to transmit/receive to and from Client Unit #1. Then, it moves on to the next Client Unit and so on to the last one on the list. Then, the Base Station goes back to #1 and repeats the process of "polling" each Client Unit.

This is in contrast to Wi-Fi CSMA protocol where packets are sent from any station so long as it senses the channel to be clear. Packets sent that way will see more collisions as the network utilization increases.

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