UNITED STATES PATENT APPLICATION

For

METHOD FOR DETERMINING OPTIMAL WI-FI EXTENDER PLACEMENT

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Description

A method for comparing relevant KPIs to determine optimal Wi-Fi extender placement. By capturing the median, non-control MCS rates on the fronthaul and backhaul, it is possible to compare the values and determine if the extender needs to move closer to or further away from the gateway. The end goal is to have equally "good" links on every hop, as the overall throughput of the system will be limited to the MCS of the "worst" link.

MCS (Modulation Coding Scheme) defines what modulation rate is used (e.g., 256-QAM) to transmit a wireless frame, and the higher the MCS, the faster a wireless frame is transmitted. Wi-Fi devices dynamically adjust MCS based on local network conditions, as lower MCS rates are more reliable, but slower. In general, if a frame is not acknowledged at certain MCS for a certain number of retries, the Wi-Fi device will "rate scale" down to a lower MCS and try again. If the data frames are all transmitted with no retries, then it will rate scale up to a higher MCS. At some point it will reach a relative equilibrium - assuming the devices are stationary.

In the attached diagram, the Gateway and Extender are communicating wirelessly (Link A), and at a reasonably stable MCS. The extender and user device are also communicating wirelessly (Link B), at a reasonable stable MCS.

If MCS(Link A) > MCS(Link B), then the extender should be moved closer to the user device. If MCS(Link A) < MCS(Link B), then the extender should be moved closed to the gateway.

It is important to note that we are only looking at the MCS of data frames. Control frames are (generally) always sent at the lowest configured MCS and should be ignored.

Background

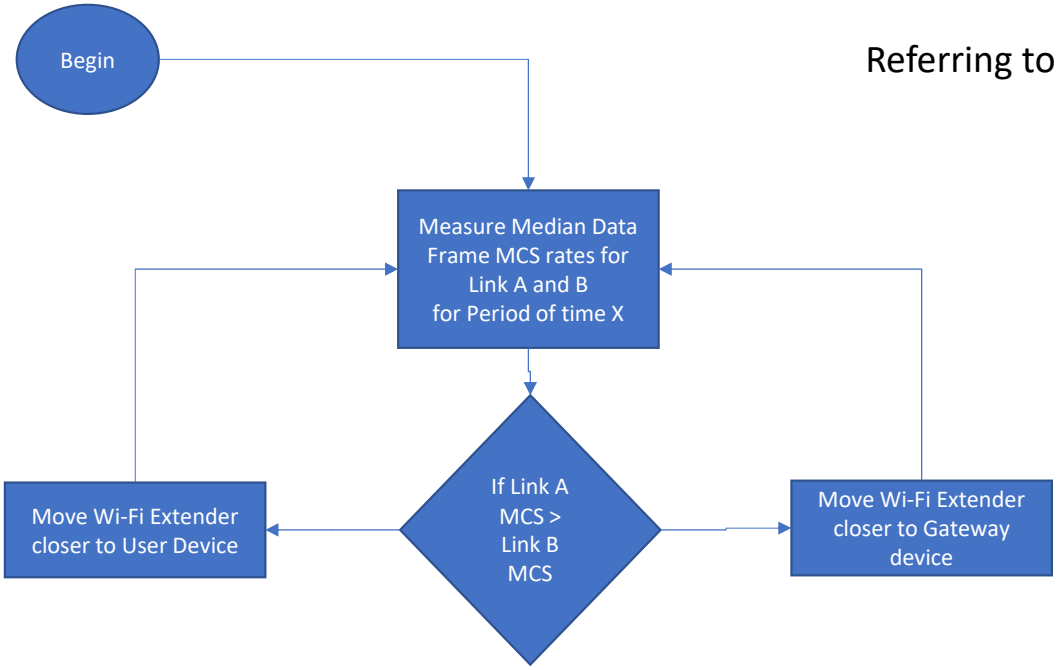
Residential Wi-Fi is increasingly using Wi-Fi Extenders, and optimal placement is non-intuitive. For example, the general "best practice" is to place the extender halfway between the usage area and the gateway, while most customers may believe the extender should be placed directly in the usage area.

By placing the extender in the best location, the customer will have the best possible user experience.

Method for determining optimal Wi-Fi extender placement

Method Flow

Referring to Topology diagram…




Wi-Fi Gateway
Link A
Wi-Fi Extender
Link B
User Device