

High Density



Introduction

Planning for Wi-Fi coverage in high-density environments can be quite different than planning coverage for low to medium density environments. We recommend reviewing the Wireless Best Practices Guide for general guidelines applicable to all installations. In addition to the recommendations in the Wireless Best Practices Guide the unique nature of high-density environments calls for some additional guidelines such as coverage area, capacity, number of APs, technology choice (802.11n versus 802.11g), and others — to aid in the optimum reliability and performance of a Smart Mesh network infrastructure.

RF Limitations

First and foremost, it is important to realize the limitations of RF. The 2.4 GHz spectrum (which 802.11b/g and some 11n radios operate on) only provides for three non-overlapping channels. This means that you realistically can only have three APs operating in an open area such a conference center or lecture hall where any client can be expected to have line of sight or near line of sight to each AP. **After saturating the air on the 3 non-overlapping channels with three APs, adding more APs will actually result in a decrease in aggregate throughput.** This may sound counter-intuitive but think of it this way: Two packets sent to two different clients have a zero percent chance of colliding if sent from the same AP. If those two packets are sent via two different APs then there is a chance they will collide; that probability of collision grows with the number of APs.

Less is More

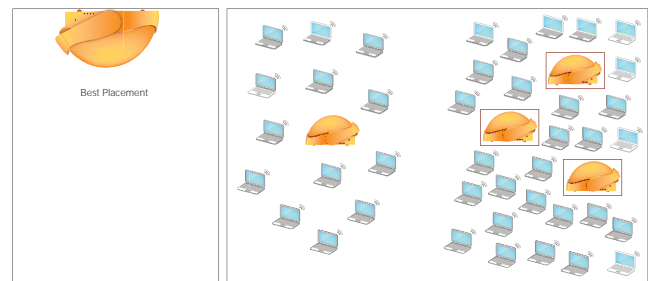
For this reason it is recommended that you should **deploy no more than four 2.4 GHz APs in a single open area.** Any more than that and client performance will start decreasing. Three of the APs should be on channels 1, 6 and 11. The fourth AP will automatically decide to choose either 1, 6 or 11 as well and while it will not improve the performance of the system over three APs it will provide redundancy should one of the APs fail. In this case the auto-channel selection algorithm will re-balance the APs to ensure the three remaining APs are on channels 1, 6 and 11.

5Ghz is Key

Since Ruckus APs support 100 clients per AP and there are only three non-overlapping channels in the 2.4 GHz spectrum (1, 6 and 11) this works out to a maximum of 300 clients in a single open area. Supporting more than 300 2.4 GHz clients in a single open area will be extremely difficult. Do anything you can to offload client to the 5 GHz band. You can deploy significantly more 5 GHz APs, dependent on the regulations in your specific country. There are a total of 23 non-overlapping channels in the 5 GHz spectrum! The addition of 5 GHz APs will greatly increase capacity (to the tune of 100 clients per AP).

Placement

Because of the high number of clients in a relatively small area, proper placement of the APs, as indicated by the Wireless Best Practices Guide becomes even more important in ensuring a stable and high performance environment. Be sure to make sure the APs are mounted with the base parallel to the ground. Also, try to bias AP placement towards areas with the most number of users.



Bias AP placement (Red) in high density areas

Use No Encryption or WPA-AES

Keep in mind when dealing with a large number of clients, any type of security adds to the headache of users trying to connect to the system. If the goal is to provide public Wi-Fi access we recommend disabling security altogether. If you must use security we recommend you use WPA-AES or WPA2-AES encryption. Avoid WPA-TKIP at all costs, **with WPA-TKIP, APs are limited to a maximum of 20 clients.** When operating in WPA-AES mode, APs are not subject to this limitation.

