Creating Wi-Fi Test Metrics

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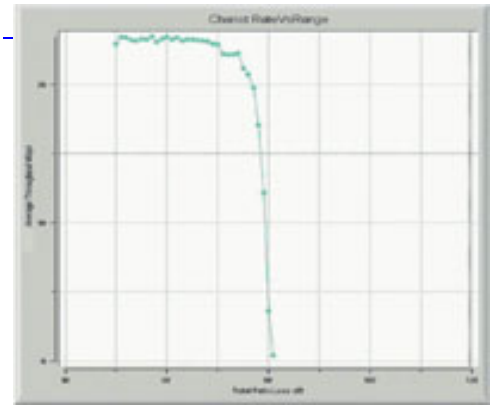
By Graham Celine

Testing techniques developed for wired devices and networks fall short when applied to the WLAN market. The inherent instability of the unwired medium — air — in which the wireless world operates and the constant mobility of the WLAN user make the 802.11 protocol an order of magnitude more complex than equivalent wired protocols. As a result, the metrics used to benchmark wired protocols are only a starting point for the WLAN industry.

Differences between wired and wireless networks require metrics and methodology for performance benchmarking that address the intricacies of the 802.11 protocol. The discussion in the article focuses on parameters critical to WLAN performance and discusses methodology to measure them. It addresses wireless-specific functions central to business-critical applications on a Wi-Fi infrastructure and includes typical results and interpretations.

WLAN Performance Metrics

Wi-Fi protocols address differences between wired and wireless networks, and the implementation of the more advanced wireless protocol demands performance validation. Algorithms used in a network's clients and APs (and the capacity of these devices to process the algorithms) limit the network's performance. The objective of the validation process and test metrics is to identify critical test parameters and find the correct method of testing them. A listing of wireless performance metrics shows that they outnumber traditional Ethernet metrics by a ratio of roughly five to one (see Table 1).



[1]

Testing Ethernet network performance is essentially a measure of packet forwarding rate. In addition to packet forwarding measurements, WLANs must undergo tests related to the unstable physical layer and end-user mobility, including automatic data rate adaptation, roaming, verification of security, QoS and overlapping BSSs, as well as behavioral tests that measure performance under abnormal network conditions. The primary focus of the testing effort should be parameters that eventually affect network efficiency and operation.

Data Rate Adaptation: Wired LANs support fixed data rates: 10/100/1000 Mb/s. Wireless networks support multiple data rates: 11/5.5/2/1 Mb/s for 802.11b; 54/48/36/24/18/12/9/6 Mb/s for 802.11a and 802.11g. The critical difference is that WLANs support dynamic rate adaptation and can operate at multiple data rates automatically determined by the end point (AP or client), based on the condition of the physical layer between it and the client device.