Describe how IEEE 802.11n MIMO technology how it increases total throughput over older technologies such as IEEE 802.11 a/b/g

Marsic (2010) discusses several wireless link-layer protocols and suggests that IEEE 802.11n can actually increase the throughput of networks beyond the capabilities of older wireless technologies. Like the previous IEEE 802.11 a, b, and g versions, the newer IEEE 802.11n works in the 2.4 and 5 GHz radio frequency bands. This alone provides fairly high bit rates, but IEEE 802.11n out strips these older technologies by including three changes:

**1. MIMO, or multiple input multiple output**

MIMO allows more information to be processed in parallel because it uses several radio transmitter and receiver antennae, each of which can establish an independent connection with other devices.

**2. 40 MHz channels for the physical layer**

Rather than independent 20 MHz radio channels, the physical layer of IEEE 802.11n can use double-wide channels for a total of 40 MHz. Moreover 4 data streams can be sent at once using either the 20 MHz channels or the larger 40 MHz channels.

**3. Frame aggregation to the MAC layer**

Frame aggregation reduces the overhead caused by packet headers. It does this by joining the payloads of multiple packets together into a single transmission. Since the ratio of payload data to header data is larger, the overall throughput increases.

All of these changes combined increases the raw data rate possible to 600 Mbps, up from 54 MBPS. Not only is the throughput increased nearly 12 fold, but reliability and transmission range is boosted as well. For example, at 300 feet IEEE 802.11n can maintain 70 MBps, whereas older technologies would fall off to 1 Mbps (Marsic, 2010). Considering vast increases in throughput even at long distances, IEEE 802.11n capable devices are called High Throughput devices. However, until all devices become IEEE 802.11n compatible, there may be bottlenecks of throughput based on integration with the older technologies.

References

Marsic, I. (2010). Computer Networks: Performance and Quality of Service. Retrieved from <http://www.ece.rutgers.edu/~marsic/books/CN/book-CN_marsic.pdf>