



VeriWave First to Demonstrate 300 Mbps Data Rate with 802.11n 3x3 MIMO Technology

Existing APs Assessed; Impact of Critical Design Decisions on Next Generation of Equipment Benchmarked

PORTLAND, OR – March 17, 2008 – VeriWave, the leading provider of wireless LAN (WLAN) performance testing, is introducing the first test solution for full-rate 802.11n 3x3 MIMO. In debuting Release 3.2 of its WaveTest software, VeriWave demonstrated that sustained data rates of over 300 Mbps are achievable and benchmarked the impact of design options currently facing vendors as they develop the next generation of higher-speed access points.

“VeriWave has the only test solution on the market that can transmit and receive at true MIMO 3x3 speeds,” says Eran Karoly, VeriWave’s vice president of marketing. “To prove high-speed, error-free, data transfer of new 802.11n 3x3 MIMO devices, an objective test tool needs to be available. With our new version 3.2, we make this test tool a reality. It is the only way 802.11n manufacturers can verify the performance of their devices.”

VeriWave’s WaveTest platform lets testers generate client traffic while varying traffic conditions thus measuring the functionality and performance of their designs, and qualifying how these designs will perform in real world conditions. As no APs supporting 3x3 MIMO operation were commercially available at the time of testing, the data rates of 300 Mbps were achieved by using the VeriWave system in back-to-back mode, i.e. the VeriWave system was used to generate the client traffic as well as the server traffic.

As part of its ongoing industry updates on the progress of 802.11n-compliant products, VeriWave performed extensive tests on existing APs that analyzed the impact of various design options currently available to vendors as they develop the next generation of higher-speed access points. Detailed results are available at: http://www.veriwave.com/gurus/release_3.2_results.asp.

Areas for Advancement Identified

“Our tests show that achieving sustained data rates greater than 150 Mbps using the 802.11n technology is in fact achievable,” says Tom Alexander, VeriWave’s Chief Technology Officer. “Our results also show that the current generation of APs shipping has a ways to go in achieving the theoretical maximum promised by this standard, which stands at over 350 Mbps. To that end, we explored some of the implementation choices available to vendors today, and believe this sort of testing can speed the introduction of new equipment that takes full advantage of the standard.”

Tests on existing Access Points conducted using Release 3.2 highlighted critical performance issues:

- **Co-existence remains an issue:** The co-existence of various types of equipment has tremendous effect on the overall quality and capacity of the deployed network. Adding 802.11a/g clients to an 802.11n network severely challenges today's APs with theoretical performance dropping 50%, from approximately 225 Mbps to roughly 125 Mbps and actual performance dropping as much as 75%. Similarly, issues remain for 20MHz / 40MHz coexistence also leading to 50% performance drops;
- **3 x 3 MIMO significantly improves performance:** Sustained data rates of over 300 Mbps are possible as measured by the VeriWave test equipment in back-to-back operation. However, as no commercially available enterprise-class and consumer-class APs support true 3x3 MIMO operation, measured data rates of these APs tops off at just over 160 Mbps;
- **All enhancements specified by the IEEE standard must be implemented:** In particular, VeriWave's testing determined that AMPDU aggregation, 40 MHz channels and Short Guard Intervals must be implemented to keep frame overhead from limiting performance. Without these enhancements, one of two enterprise-class 802.11n APs tested was not even able to sustain legacy 802.11g rates;
- **As expected, 40MHz channels double capacity over 20MHz channels** enabling sustained MAC data rates of approximately 250 Mbps. To date, enterprise-class APs have not yet fully realized this benefit;
- **Using Long Guard Interval in Short Guard Interval networks has little effect:** Mixing long and short guard intervals results in "in-between" aggregate throughput, but current enterprise-class APs can not take full advantage of this yet.

Going forward, VeriWave's latest round of tests explored critical design decisions currently facing AP developers:

- **AMPDU aggregation boosts throughput by a factor of 3:** VeriWave's testing determined that AMPDU aggregation enables peak rates greater than 100 Mbps with 20 MHz channels and 2x2 MIMO operation;
- **Short Guard Interval increases efficiency but only incrementally:** With large frames, a slight gain from shortening the Guard Interval between symbols from 800 to 400nSec is noticeable with data throughput increasing from 242 Mbps to 266 Mbps.

VeriWave shared these and other results during a recent Webinar, the third in an ongoing series on the evolution of 802.11n. The Webinar content can be viewed at <http://www.veriwave.com/gurus/webinararchive.asp>. To receive more information on the next installment in the Webinar series, please e-mail your request to info@veriwave.com.

Availability

Release 3.2 of the 802.11n WaveTest software is currently shipping.

About VeriWave

VeriWave is the leading provider of test systems for performance analysis of wireless local area network (WLAN) products. VeriWave's products are used by equipment manufacturers to accurately analyze the performance of their products, as well as by carriers and enterprise users to make the right choice when selecting WLAN equipment for deployment in their networks. For more information about VeriWave, call (503) 473-8350, or go to www.veriwave.com

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