WaveBlade Traffic Generation and Analysis (TGA) Modules

IxVeriWave's WaveBlade series provides a state-of-the-art, industry-first test solution for evaluating the functionality and performance of Ethernet and IEEE 802.11-based WLAN networking products. Designed for testing network infrastructure devices including consumer access points (AP) and reference designs, enterprise/carrier grade access points and controllers, and entire Wireless LAN (WLAN) networks, WaveBlades integrate both traffic generation/analysis and multi-path channel emulation capabilities on a single platform.

WaveBlade Wi-Fi (WBW) modules include:

- *The WBW2000/2600* generating traffic from hundreds of independent stateful clients, making it easy to determine the effects of complex MIMO propagation on 802.11n access point and controller performance by subjecting each individual client to any of the IEEE-defined channel emulation models

- *The WBW1104N* generating more than 500 Mbps of traffic from 2000 fully stateful clients per blade to enable cost-effective, feature-rich functional and performance testing of 802.11n controllers

- *The WBW1001P,* a single-port, high-power 802.11 module suitable for open air testing

Ethernet Server WaveBlades provide a complete Layer 2-7 test module used to evaluate the functionality and performance of Ethernet-based networking products. Designed for testing network infrastructure devices such as access points, broadband home gateways, controllers, switches, and routers WaveBlade Ethernet (WBE) modules integrate traffic generation and analysis capabilities on a single platform. Each Ethernet WaveBlade port generates fully interleaved, multi-protocol IP traffic from hundreds of independent Ethernet clients or servers at wire-speed.

Highlights

- Up to 500 fully independent stateful clients per port

- WaveBlade Wi-Fi (WBW):

    Highly scaled setup in a single test-bed to test real-world deployment levels of controllers, APs, and clients

    Ease-of-use through simplified setup including single-click selection of desired channel model

    Built-in channel models help determine real-world performance in six typical WLAN multi-path scenarios

- WaveBlade Ethernet (WBE):

    Generates wire-speed stateful TCP traffic

    Complete control over MAC and IP addressing scheme

    Wire-speed flow generation

    Real-time statistics to track more than 130,000 traffic flows

    Industry-best packet capture

    Ease-of-use through simplified setup

WaveBlade Wi-Fi 802.11a/b/g/n and Ethernet line-cards fit into IxVeriWave's WT90 and WT20 chassis and interwork seamlessly with one another to provide complete functional and large-scale testing. Modules provide the essential tools necessary to complete various types of testing ranging from functional testing at the AP level to scale testing a large 802.11n infrastructure network.
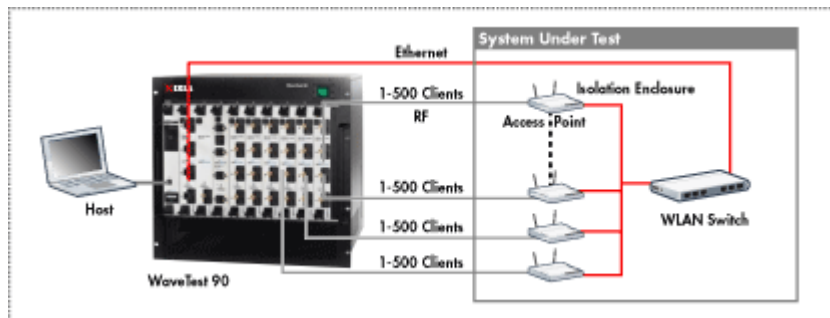

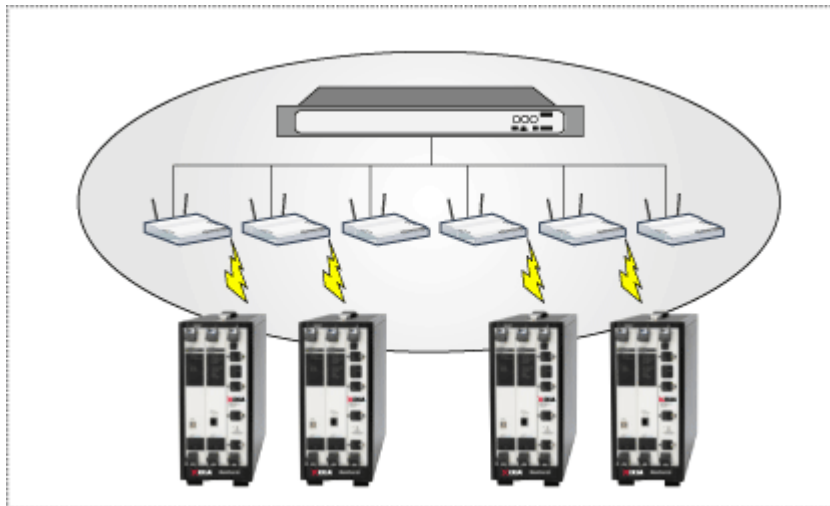*Figure 1: Typical lab test setup using WBW1104*

Figure 2: Open-air field test using WBW1101P

Figure 3: WaveBlade Ethernet

Key Features

- WaveBlade Wi-Fi (WBF):

    o Up to 500 fully independent, stateful 802.11 clients per port enable precise measurement of critical performance metrics at data rates reaching up to maximum theoretical limits

    o Highly scaled setup in a single test-bed to test real-world deployment levels of controllers, APs, and clients

    o Ease-of-use through simplified setup including single-click selection of desired channel model to be used on clients in a wide-array of IxVeriWave Test Suites

    o Built-in channel models help determine real-world performance in six typical WLAN multi-path scenarios, per recommendations of IEEE 802.11n task group (WBW2000/2600 only)

    o Full support of IEEE 802.11 a/b/g/n traffic generation and analysis simplified setup in a wide array of IxVeriWave Test Suites, applications, and WaveAutomation

- WaveBlade Ethernet (WBE)

    o Up to 500 fully independent Ethernet clients /subscribers or servers per port enable precise measurement of critical performance metrics at data rates reaching up to 1 Gbps

    o Capable of generating wire-speed stateful TCP traffic and other traffic including raw Ethernet frames, UDP, RTP etc.

    o Complete control over MAC and IP address scheme including automatic addressing and incremental addressing per user-defined step sizes

    o Wire-speed interleaved flow generation with unique ID, rate, timestamps, sequence numbers, data integrity signature, and flow group identifiers

    o Real-time statistics to track up to 131,072 traffic flows and 16 user customizable latency histogram buckets

    o Industry-best simultaneous bi-directional (TX/RX) wire-speed packet capture support of up to 256MB on each port

    o Ease-of-use through simplified set-up in a wide-array of IxVeriWave Test Suites and WaveAutomation

Specifications

	WBW 3601 WBW 3602	WBW1601 WBW1601P WBW1101* WBW1101P*	WBW2600 WBW2000*	WBW1604N WBW1104N*	WBE 1601 WE 1101*	WBE 1604 WBE 1104*
Number of ports	1 or 2	1 x 802.11 a/b/g/n port	1 x 802.11 a/b/g/n port	4 individual and independent 802.11 a/b/g/n ports supporting multi-user and multi-test beds	1	4
Maximum number of ports per chassis	9 or 14	9	9	36	9	36
Number of interleaved flows (per WaveBlade)	1000 or 2000	1000	10000	4000	1000	4000

Connector type					RJ45
Ethernet PHY type					10/100/1000 Mbps
MIMO configuration	U pto 4x4 MIMO 802.11 ac	Single spatial stream per port	Support for 2x2, 2x3, 3x3 with spatial multiplexing	Single spatial stream per port	
PLCP mode	Legacy, Mixed-mode				
Operating frequency	2.4 GHz, 4.9 GHz and 5 GHz				
IEEE channel models	Model A – typical home/small office environment Model B – typical medium office environment Model C – typical large office environment Model D – typical open space environment Model E – typical large open space environment Model F – complex environment with many scatters By-pass mode – to not impose any channel conditions				
Guard interval selection (per client control)	800 / 400 ns				
Spatial streams (NSS)	1 to 4	1	1 to 3	1	
PHY rates	6.5 Mbps to 1733.3 Mbps (MCS index 0 to 9)	6.5 Mbps to 157.5 Mbps (MCS Index 0 to 7)	6.5 Mbps to 450 Mbps (MCS Index 0 to 23)	6.5 Mbps to 157.5 Mbps (MCS Index 0 to 7)	
FEC coding rates	1/1, 2/3, 3/4, 5/6				
Channel bandwidth	20 MHz, 40 MHz, 80 MHz	20 MHz, 40 MHz			
Legacy PHY rates	1, 2, 5.5, 6, 9, 11, 18, 24, 36, 48, 54 Mbps				
Aggregation types	• Tx and Rx: A-MPDU and Block-Ack • Rx only: A-MSDU				

Transmit power control	-50 dBm to +14 dBm in 1 dB steps	-50 dBm to 0 dBm in 1 dB steps ((WBW 1101) 0 dBm to +15 dBm in 1 dB steps ((WBW 1101P, 1601P)	-50 dBm to 0 dBm in 1 dB steps	-50 dBm to 0 dBm in 1 dB steps	
Transmit power accuracy	+/-1.0 dB (Typical)				
Transmit capability					Wire-speed hardware frame generation with timestamps, sequence numbers, data integrity signature, and flow group Identifiers
Optional in-path attenuation		20 db (WBW1101) No (WBW 1101P, 1601P)	20 db	20 db	
Receive Sensitivity	-79dBm min for BPSK -54dBm for 256-QAM	• -82 dBm min for 8x10-2 FER (1Mbps CCK) • 65 DBm min for 10x10x2 PER (64-QAM 5/6))			
Receive capability					Wire-speed frame filtering, data integrity, and sequence checking, capture, real-time latency measurement on each flow
Operation Channels	• 2.412 to 2.484 GHz: 1 to 14 • 4.940 to 4.990 GHz: 21, 25 • 5.180 to 5.320 GHz: 36, 40, 44, 48, 52, 56, 60, 64 • 5.500 to 5.700 GHz: 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140 • 5.740 to 5.825 GHz: 149, 153, 157, 161, 165				
Antenna interface connector configurations	4 connectors	1 connector	3 connectors	1 connector per port 4 total per blade	
Antenna interface connectors	• SMA female connector, standard thread • AC coupled, 50 Ohms				
Traffic timestamp	50ns				

accuracy						
Maximum number of stateful clients per port	500	500	500	• 500 per port • 2,000 total per Wave-Blade	500	• 500 per port • 2,000 total per Wave-Blade
Maximum number of traffic flows generated per port	• 1,000	1,000	1,000	• 1,000 per port • 4,000 total per Wave-Blade		
Maximum number of traffic flows analyzed per port	131,000	131,000	131,000	• 131,000 per port • 524,000 total per WaveBlade		
802.11 MAC control (all parameters)	Independent per client					
802.1x authentication support	PEAP/MSCHAPv2, TLS, LEAP/EAP-FAST, TTLS					
Encryption support	WEP-40 and WEP-104, TKIP (WPA), AES-CCMP (WPA2)					
OSI layer 3 and layer 4 (IP, UDP, TCP, etc.) control (all parameters)	Independent per client					
Port counters	Comprehensive set of layer 2, 3 and 4 frame types					
Client control	Control frames, management frames, action frames					
Flow and flowgroup ounters	Frames sent / received, bytes sent / received, out-of-order frames, payload integrity, latency histogram					
Capture buffer (per port)	256 MB					
User defined field modifier (per flow)					Increment or decrement by user-defined step; up to 256 bytes from start of frame	
Frame length control					Fixed, increment by user-defined step or automatic	

Statistics and rate counters		Link State, Line Speed, Frames Sent, Signature Valid Frames Received, Signature Error Frames Received, Bytes Sent/Received, Fragments Received, Undersize, Oversize, VLAN Tagged Frames, Per User Priority QoS counters, FCS errors, Bad Sequence Errors, Bad Payload Checksum, ARP, DHCP and Ping requests and replies, IP/ICMP/UDP/TCP checksum errors, IP Multicast packets, Sent/Received IP Packets
Flow analysis		Real-time statistics to track up to 131,072 flows
Time-stamp accuracy		50 ns resolution
IPv4, UDP, TCP		Hardware checksum generation
IPv6 (available on WBW1601, WBW1601P, WBW2600, WBW1604N, WBE1601, WBE1604)	NDP: Neighbor/router discovery and address assignment ICMPv6 & DHCPv6 Multicast Listener Discover (MLDv1. MLDv2) Dual stack operation of both IPv4 and IPv6 UDP, RTP, stateful TCP, and multicast flows Max of 32 IPv6 addresses per client: One Link-local, up to 31 Global	

*IPv4 only

Calibration

IxVeriWave chassis and management modules do not require periodic adjustment or calibration. Similarly, WBW modules are calibrated at the factory and maintain advertised specifications without requiring additional calibration.

Minimum Requirements

IxVeriWave Test System	1 x IxVeriWave WaveTest 90™ or WaveTest 20™ system
Host Computer	x86-based PC with 1 GHz processor and 256 MB RAM Windows XP SP2, or Linux (2.6 or higher kernel level) with Web Browser installed to manage the WaveBlade

Ordering Information

980-2008

IxVeriWave WBW (WaveBlade Wi-Fi) 1601 802.11 a/b/g/n Multi-client Traffic Generator/Performance Analyzer for wireless IEEE 802.11 a/b/g/n networks; low-power SISO single port; includes Standard Accessory Package A; IPv6-capable

980-2011

IxVeriWave WBE (WaveBlade Ethernet) 1601 Multi-client Traffic Generator / Performance Analyzer for 10/100/1000 Mbps Ethernet networks; IPv6-capable