Spirent **TestCenter™**

WLAN Multi-Client Emulation and Testing

Applications

- Multi-client WLAN network testing scenarios
- AP Personal and Enterprise security type testing
- AP interwork testing with various mixes of different IEEE 802.11 mode clients
- Association processing and timing testing under various authentication selections
- Benchmark or baseline testing for traffic throughput, TCP good-put, forwarding rate, and latency performance
- RFC-style testing originating from a large number of clients across APs through the WLAN RF interface
- Maximum client support, medium capacity testing, throughput vs. packet size, throughput vs. associated client numbers, etc.
- Roaming, drop and re-association process, admission control and load balancing
- Rate vs. range testing with an external attenuation setup

Spirent TestCenter supports the highest performing and most realistic IEEE 802.11 wireless local area network (WLAN) multi-client emulation for direct functionality and performance testing of Access Points (APs) and end-to-end testing of WLAN ecosystems that includes WLAN access controllers, and gateways. By adding one or more WLAN client emulation cards to the Spirent TestCenter C1/C50 appliances, or N4U/N11U chassis, users can emulate a large number of realistic 802.11 a/b/g/n/ac clients on either 2.4GHz or 5GHz frequency band to connect with an access point via a cabled conductive or over-the-air (OTA) link. Basic WLAN control plane and data plane features along with the advanced IETF RFC style network traffic and throughput performance test cases are supported over the WLAN network involving the emulated clients and the APs under test.

The WLAN RF interface network card (NIC) and test modules offered consist of multiple IEEE 802.11 radios on each WLAN test port and provide the maximum user configurability and flexibility to emulate various IEEE 802.11 clients on either 2.4GHz or 5GHz band. A WLAN test port refers to a set of MIMO RF ports with the SMA connectors for either antennas for OTA link or cable conductive connections. A single WLAN test port supports emulated clients with different 802.11 protocol modes and spatial streams for the best realistic client emulation scenarios. Designed for testing WLAN network infrastructure devices, including carrier or enterprise thin APs with controllers, consumer APs, and integrated broadband WLAN gateway, Spirent TestCenter WLAN solutions offer the best in class traffic generation and analysis for testing functionality, performance, and scalability.

Figure 1: C1 appliance with a single WLAN NIC

Figure 2: C50 appliance with two WLAN NICs

Features & Benefits

- Spirent appliances and chassis based WLAN Testing solutions with customizable hardware configurations
- Utilize both in-chassis Ethernet and WLAN test ports for emulating a very large number of realistic WLAN clients with traffic generation and analysis
- A single WLAN test port used for multiple client emulation is capable of supporting either 2.4GHz or 5GHz frequency band
- Support various power spectrum and channel alignment plans for different geographic regions globally
- A single WLAN test port supports multiple 802.11 modes and different spatial streams on either 2.4GHz or 5GHz frequency band
- Maximally interoperable with various different chipset vendors based WLAN AP products
- Best-in-class realistic traffic generation and analysis between WLAN clients and Ethernet clients /servers or WLAN clients
- Capable of providing multiple traffic flows per client with each flow offering stateful traffic at layers 2-7
- Capable of generating realistic and stateful WLAN client traffic individually on per client basis
- Support individually controlled client behavior providing accurate control of 802.11, 802.3, and IP characteristics, including medium access control, authentication and encryption, frame size, and rate
- Emulate client association mode in either a designated sequential or more realistic random fashion
- Support various IETF RFC style test cases (RFC2544 and RFC2889) for throughput, routing, forwarding performance testing
- Each emulated client supports the full MAC per 802.11 standard independently
- 802.1x supplicant supports full EAP stack per client
- Support WEP-64, WEP-128, WEP-152, and WEP-256, TKIP (WPA), AES-CCMP (WPA2)
- Upper layer protocols (e.g., DHCP and TCP) are fully supported using independent protocol tasks
- Test AP's data plane performance using flow packets of different sizes, protocol types, encryptions, authentications, and throughput
- Transmit capability—Wire-speed hardware packet generation with timestamps, sequence numbers, data integrity signature, and flow group identifiers
- Receive capability—Wire-speed packet filtering, data integrity, and sequence checking, capture, real-time latency measurement on each flow
- Support different packet length control functionalities including fixed, increment, decrement by user-defined step or auto-matic, list, random and shuffle
- Per port statistics and rate counters—Link State, User programmable Line Speed, Packets Sent, Signature Valid Packets Received, Bytes Sent/Received, Fragments Received, Undersize, Oversize, VLAN Tagged Frames, 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
- Support a sniffer type IEEE 802.11 packet over-the-medium capture for a real-time Wireshark display or other precise post processing
- Simultaneously 802.3 packet capture on the Ethernet NIC and 802.11 packet capture on the WLAN NIC up to 256MB per port, respectively
- Extensive 802.11 stats, counters, and statistics report in either real-time or periodically on per client or per port basis
- Support 802.3 and 802.11 real-time port statistics, per flow statistics, and port-level histogram

Figure 3: 802.11 a/b/g/n/ac WLAN FX2 test module

Technical Specifications	
802.11 Protocols	IEEE 802.11 a/b/g/n/ac capable
Maximum Number of Emulated Clients	802.11AC NIC: 256 802.11 a/b/g/n/ac clients 802.11ACN NIC: 128 802.11 a/b/g/n/ac clients and 400 802.11 a/b/g/n clients 802.11ACN NIC: 800 802.11 a/b/g/n clients FX2-11AC-2: 512 802.11 a/b/g/n/ac clients FX2-11ACN-2: 256 802.11 a/b/g/n/ac clients and 800 802.11 a/b/g/n clients
MIMO Supported	Support various MIMO configurations 1x1, 2x2, and 3x3
Coding Supported	Supports Spatial Multiplexing, Cyclic-Delay Diversity (CDD), Low-Density Parity Check (LDPC), Maximum Ratio combining (MRC), Space Time Block Code (STBC)
Frequency Band	Operating frequency band - 2.4 GHz (802.11 b/g/n) and 5 GHz (802.11 a/n/ac)
Guard Interval	Guard interval selection - 800/400 ns for 802.11 n/ac
PHY Rates	PHY rates - 6.5 Mbps (802.11b) to 450 Mbps (802.11n, 40MHz, 3x3, MCS23) and 1300.0 Mbps (802.11ac, 80MHz, 3x3, MCS9)
MCS Type	Full MCS index support in 802.11 n/ac • all 0-23 MCS index for 802.11n • all 0-9 MCS index for 802.11ac
Rate Adaptation	Support full rate adaptation by default
Coding Rates	FEC coding rates - 1/1, 2/3, 3/4, 5/6
Channel Bandwidth	20 MHz, 40 MHz, and 80 MHz
Frame Aggregation	802.11 n/ac Aggregation types: Both Tx and Rx A-MPDU, A-MSDU, and Block ACK
DFS Support	Supports Dynamic Frequency Selection (DFS)
Maximum TX Power (2.4GHz)	Maximum default TX power per chain: 4dBm (+-2dB tolerance) on 2.4GHz band
Maximum TX Power (5GHz)	Maximum default TX power per chain: 0dBm (+-2dB tolerance) on 5GHz band
Transmit Power Control	Transmit power control: 16dB range in 1 dB step
RX Sensitivity (2.4GHz)	Minimum receiver sensitivity level: -80 dBm (+-2dB tolerance) on 2.4GHz band
RX Sensitivity (5GHz)	Minimum receiver sensitivity level: -75 dBm (+-2dB tolerance) on 5GHz band
Channel and Frequency	Operation Channels: • 2.412 to 2.484 GHz: 1 to 14 • 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
Interface Connector	Antenna interface connectors • SMA female connector, standard thread, AC coupled, 50 Ohms
Authentication Support	802.1x - PEAP/MSCHAPv2, TLS, LEAP/EAP-FAST, TTLS
Encryption Support	WEP-64, WEP-128, WEP-152, and WEP-256, TKIP (WPA), AES-CCMP (WPA2)
Power Consumption	< 15w

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About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information, visit: www.spirent.com

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Description	Part Number
C1/C50 WLAN Solutions	
C1 KIT with 4 PORT 1G COPPER 11AC WLAN AND 2015 PROTOCOL PACK • C1 appliance • 4 port 10/100/1000Mbps • 1 x 802.11AC NIC: Support 256 802.11 a/b/g/n/ac clients, 3x3 MIMO, up to 80 MHz channel bandwidth • All C1 2015 protocols with WLAN support	C1-KIT-05-2015-11AC
C1 KIT with 4 PORT 1G COPPER 11ACN WLAN AND 2015 PROTOCOL PACK • C1 appliance • 4 port 10/100/1000Mbps • 1x 802.11ACN NIC: Support 128 802.11 a/b/g/n/ac clients and 400 802.11 a/b/g/n clients, 3x3 MIMO, up to 80 MHz channel bandwidth • All C1 2015 protocols with WLAN support	C1-KIT-05-2015-11ACN
C50 KIT with 4-PORT 10G/1G SFP, 2 WLAN NICs, HW TIMING, WLAN STARTER KIT • C50 chassis with hardware timing • 1x802.11AC NIC: Support 256 802.11 a/b/g/n/ac clients, 3x3 MIMO, up to 80 MHz channel bandwidth • 1x 802.11N NIC: Support 800 802.11 a/b/g/n clients, 3x3 MIMO, up to 40 MHz channel bandwidth • 4 port 1/10G • C50 Layer 2–3 & 2544 starter kit with WLAN support	C50-KIT-07-START
FX2 WLAN Test Modules	
FX2 802.11 AC 2-PORTS For SPT-N4U and SPT-N11U chassis with 2 test ports, support 512 802.11 a/b/g/n/ac clients, 3x3 MIMO, up to 80 MHz channel bandwidth, 802.11 b/g/n on 2.4GHz, 802.11 a/n/ac on 5GHz	FX2-11AC-2
FX2 802.11 AC AND 802.11 N/G/B/A 2-PORTS For SPT-N4U and SPT-N11U chassis with 2 test ports, support up to 256 802.11 a/b/g/n/ac clients and 800 11 a/b/g/n clients, 3x3 MIMO, up to 80 MHz channel bandwidth, 802.11 b/g/n on 2.4GHz, 802.11 a/n/ac on 5GHz	FX2-11ACN-2
Accessories	
RF cable, double shielded 96", 50 ohm, Straight SMA to SMA	ACC-5100
Antenna, high gain, dual-band omni-directional SMA 9dBi	ACC-5101
Attenuator, 10 dB	ACC-5102
Attenuator, 20 dB	ACC-5103
Attenuator, 30 dB	ACC-5104
Reverse Polarity SMA male to SMA female adapter	ACC-5105
Single AP RF isolation chamber; 4 SMA connectors; filtered RJ-45 port; with fan and front access	ACC-5106
Including 3x ACC-5100, and 3xACC-5105	ACC-WIFI-PKG-1
Including 3x ACC-5100, 3xACC-5101, and 3xACC-5105	ACC-WIFI-PKG-2

A full complement of Spirent protocol and test packages are available with perpetual and subscription licensing options. Please contact your Spirent sales representative to select the right option for your test needs.

Spirent Promise. Assured.

Rev C | 08/18