EXFO's Wi-Fi Offload Testing Solution

High-capacity and high-performance test tool for wireless-local-area-network (WLAN) gateway testing, with great flexibility to replicate complex real-life situations and proprietary implementations.

SPEC SHEET

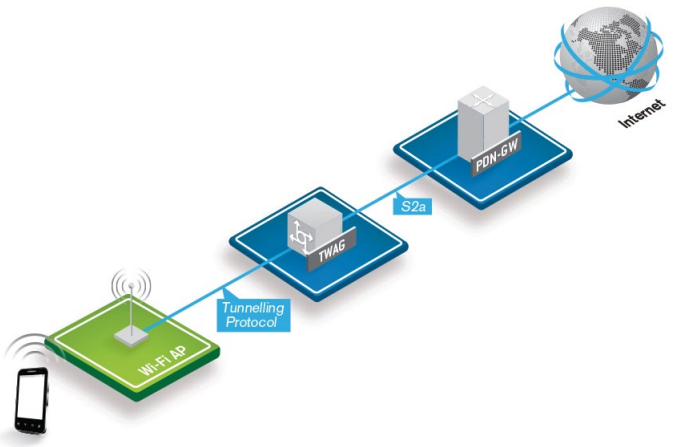
KEY FEATURES

- Up to one million Wi-Fi access points and subscribers per 10 Gigabit Ethernet port
- Support of layer-2 encapsulation over generic routing encapsulation (GRE)/(L2oGRE)
- PDN Gateway (PGW) simulation on S2a based on 3GPP Rel-12 SaMOG architecture
- Application server simulation
- Support of voice and video over Wi-Fi
- Line-rate traffic generation with a realistic mix of traffic patterns
- Real-time statistics for all streams
- Flexible architecture to support proprietary specifications and negative tests
- Smart Replay mechanism for testing today's and tomorrow's services

EXFO

OVERVIEW

Industry reports suggest that in the coming years more than half of mobile Internet traffic is expected to be offloaded to the fixed network by means of Wi-Fi and femtocells. According to one report in particular (Cisco VNI Mobile, 2015), by 2019, Voice over Wi-Fi (VoWi-Fi) minutes of use will account for more than half (53 percent) of all mobile Internet protocol (IP) voice traffic. These projections seem realistic considering the number of small cells being deployed by mobile network operators (MNOs), as well as their initiatives to offer high-definition (HD) voice over their networks.



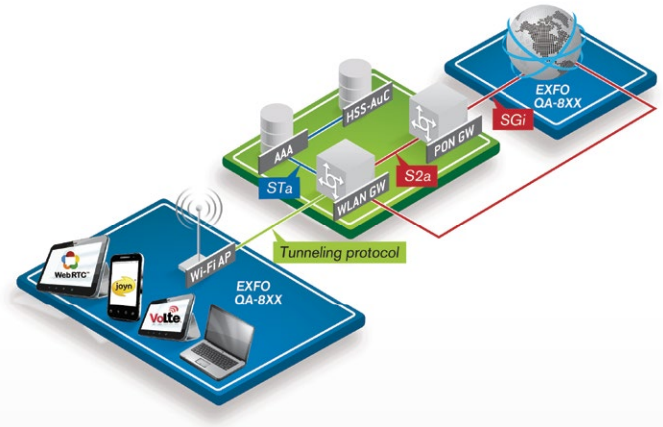
Small cells include unlicensed carrier-grade Wi-Fi access points. The WLAN access network is considered a type of non-3GPP access network, meaning that these accesses were not specified in the 3GPP. For this reason, they are categorized as either “trusted” or “untrusted” accesses by the 3GPP.

An operator-built Wi-Fi access with the required level of encryption and authentication mechanisms is considered a trusted Wi-Fi access, the key element of which is the trusted wireless access gateway (TWAG). The Wi-Fi access points are connected to the TWAG using any of the various types of tunneling protocols. The TWAG is connected to the PDN-GW over the S2a interface. The 3GPP Rel-12-defined (S2a mobility based on GPRS tunneling protocol [GTP]) SaMOG architecture, specifies the use of GTP on the S2a interface.

The challenge for MNOs who have been offering cellular services is to integrate the non-3GPP access networks into their core network, which not only involves the complexity of integration, but also capacity and performance requirements that must be met.

EXFO’S WI-FI OFFLOAD TEST CONFIGURATION

EXFO’s Wi-Fi offload testing solution tests the TWAG, and is built on the proven QA-8xx platform and purpose-built W2CM 10 Gbit/s module. The solution is equipped with unique capabilities and strengths to overcome the challenges of validating the Wi-Fi gateway/controllers and their integration with the core network.



Configuration 1: End-to-End Testing

EXFO’s test solution can be used for end-to-end verification of the integration of the carrier-grade WLAN access with the core network. The solution simulates the trusted Wi-Fi access network (TWAN) and application servers, and tests the WLAN-GW (TWAG), PDN-GW, authentication, authorization and accounting (AAA), and the home subscriber server (HSS).

The following scenarios are supported in the above test configuration:

- Simulation of Wi-Fi APs and UEs as remote authentication dial-in user service (RADIUS) clients
- Authentication of UEs using EAP-SIM, EAP-AKA, EAP-TLS and EAP-TTLS
- DHCPv4- and DHCPv6-based IP address allocation
- Generation of data traffic based on layer-2 encapsulation over GRE (L2oGRE)
- Mix of real-world network-traffic service testing, including HTTP, FTP, RTP and more
- Support of audio and video over Wi-Fi, and real-time quality measurement
- Support of unique MAC ID per UE for all the simulated UEs
- Closed service-set-identifier (SSID) support for access points
- Support of IPv4 and IPv6 access points
- Intra-SSID mobility Wi-Fi AP-to-Wi-Fi AP handover with the same SSID (closed SSID)
- Support of VLAN tagging for control and user-plane traffic
- Network address translation (NAT) support between WLAN-GW and the app server

Configuration 2: Wrap-Around Testing

For the wrap-around test of the WLAN-GW (i.e. TWAG), EXFO's solution can simulate the trusted Wi-Fi access network (TWAN), the PDN-GW and the application servers. The simulated PDN-GW can communicate with the external AAA over the S6b interface. The S2a interface is based on GTP according to the Rel 12 SaMOG architecture.

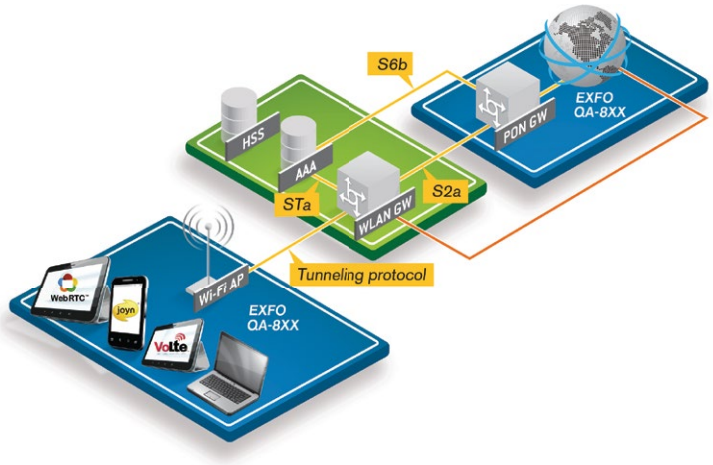
In addition to the scenarios mentioned above for the wrap around testing, the following scenarios are also supported on the S2a and S6b interfaces when the PDN-GW is simulated by EXFO:

S2a procedures (GTP based)

- Initial attach procedure
- UE initiated detach and PDN disconnection.
- Network initiated dedicated bearer activation
- Network initiated bearer modification
- Network initiated resource allocation deactivation

S6b procedures

- PGW initiated authorization procedure (AAR and AAA)
- PGW initiated session termination procedure (STR and STA)
- Capability exchange procedure (CER and CEA)
- Device watchdog procedure (DWR and DWA)



KEY USE CASES

- Simulate millions of UEs and verify the capacity of the WLAN-GW (or TWAG) on the following parameters:
  - Authentication and accounting rate on L20GRE
  - Data-session setup rate
  - Data-session setup rate on S2a (GTP)
  - Total throughput for the data traffic
  - Handover rate
- Verify how many concurrent UEs can be connected to the network with active data traffic
- Verify if bearer paths of the UE created on the GRE is correctly mapped with the bearer path on the GTP
- Generate and analyze the data traffic to validate whether the network can provide the desired quality of service
- Configure the test traffic to verify part of the traffic going through the evolved packet core (EPC), and the rest going through local breakout
- Verify the impact on the equipment and the network by inducing failure scenarios (e.g., by delaying the message response and corrupting or modifying the messages sent by UE/AP)
- Verify the proprietary implementations by developing custom-made call flows and proprietary protocols for control-plane communication
- Exercise the entire operator network infrastructure by testing end-to-end service delivery using a mix of control-plane and user-plane traffic
- Verify the WLAN-GW in isolation by simulating all the surrounding nodes to verify what impact a success/ failure in one interface has on other interfaces

UNMATCHED FLEXIBILITY

In some cases, the communication between the Wi-Fi AP and access controller can be proprietary. EXFO's testing solution provides an intuitive graphical interface for the purpose of adding, deleting and modifying state-machine and information elements. Easy modification of call flows and their immediate use minimizes the end user's dependency on the test tool vendor.

SMART REPLAY MECHANISM

The Smart Replay feature allows for easy creation of user-plane traffic through the importation of a packet capture (PCAP) file; this easy creation of the user-plane traffic using the Smart Replay feature helps with the verification of new data applications and their impact on the network. Again, this feature makes it possible to verify new applications with no dependency on the test tool vendor.

SUPPORTED PROTOCOLS

PROTOCOL	SPECIFICATION NUMBER
DHCPv4	RFC 2131
DHCPv6	RFC 3315
RADIUS	RFC 2865, 2866
Extensible authentication protocol (EAP)	RFC 3748
EAP-SIM	RFC 4186
EAP-AKA	RFC 4187
EAP-TLS	RFC 5216
EAP-TTLS	RFC 5281
GRE Layer-2 encapsulation over GRE (L2GRE)	RFC 1701, RFC 2784
Architecture Enhancements for Non 3GPP Access	TS 23.402 v12.8.0
S2a	TS 23.852 v12.0.0
S6b	TS 29.273 v12.7.0
Diameter	RFC 3558, 4005
GTPv2	TS 29.274 v12.7.0
IPv4	RFC 791
IPv6	RFC 2460

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