Enabling Service Providers to Deliver Profitable Managed and Hosted Enterprise WLAN Services with vWLAN Technology
**Introduction**

Wi-Fi has become the preferred method of access to the network. Enterprise mobility is no longer a luxury, but has become a requirement. The smartphone and tablet era has created an explosion of wireless devices. Many businesses however, lack the internal resources and know-how to design, deploy and manage a secure, reliable, high-performance wireless Local Area Network (WLAN). IDC estimates that only 10 percent of WLANs are currently being provided as a managed service and expects this market will grow at more than 20 percent annually. The current lack of managed service penetration in the WLAN market has created a $1 billion opportunity.

At the same time, mobile network operators around the world are under tremendous pressure to meet the exponential growth in subscriber demand for mobile data. This creates larger problems as the price point for data continues to decline, including declining revenues and profit erosion. This is further amplified by the fact that demand for data will soon exceed operator capacity and the expectation that the cost to transport data will outpace the revenue it generates. Mobile network operators must consider new streams of recurring revenue apart from traditional hotspot offerings such as managed and hosted enterprise WLAN services. They must also explore implementing cost-effective, complimentary technologies such as Wi-Fi, which eliminate the lead times, licenses, and complexity associated with spectrum acquisition.

This white paper outlines ADTRAN’s ability to enable service providers to deliver profitable managed and hosted enterprise WLAN services using carrier grade and highly scalable Bluesocket virtual WLAN (vWLAN) technology. ADTRAN’s proposed solutions also provide the capability to support a broad range of other carrier applications such as 3G/4G offload, small cells, managed and hosted hotspots/broadband access, backhaul, and high density.

Solution providers currently offering a managed WLAN service utilize a design with a single-tenant, premises-based hardware controller architecture. In this conventional WLAN scheme, the data and the control planes are bonded to a traditional hardware controller resulting in many cost and operational constraints. Realizing the limitations of this architecture, ADTRAN has enabled an easier, more profitable solution.
Purpose built for the stringent requirements of Tier 1 and Tier 2 service providers, the carrier-class, highly scalable, multi-tenant Bluesocket vWLAN solution uses innovation in virtualization to separate the control and management planes from the data plane, freeing the control and management planes from the LAN. With ADTRAN's Bluesocket vWLAN, the control and management planes for multiple tenants can be centralized anywhere in the world, including at a network operator's data center or network operations center (NOC), using a virtual server architecture rather than a hardware controller. This provides a number of benefits and advantages for both the carrier and the end user including:

**Elimination of Controller Hardware**
Eliminating WLAN hardware controllers provides a number of advantages including:

- Significantly reduces CAPEX and OPEX
- Eliminates physical controller constraints
- Simplifies and speeds addition of more users, locations, access points (APs), or multiple customers within a vWLAN

- Increases capacity and simplifies scaling with a software-based controller
- Increases flexibility by removing concerns about old, out-of-date hardware controllers
- Provides centralized management and control of the entire network without being burdened by the throughput and scalability of a hardware controller
- Simplifies and increases scalability
- Reduces carbon footprint and energy consumption by eliminating controller hardware

**Multi-Tenant Support**
With vWLAN, service providers can manage multiple customers within a single software instance. Multi-tenant support allows a mobile network operator to configure, control and manage both users and APs for multiple customers on a single vWLAN software instance. Configuration and reporting are available on a per-customer basis, with customers segregated from one another.

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**ADTRAN Bluesocket vWLAN with Multi-Tenant Support**
Seamless, Simplified, Massive Scaling
ADTRAN’s Bluesocket vWLAN technology allows for software-driven scaling and greater capacity. With vWLAN, the addition of more users, locations, APs, or even multiple customers does not drive the need for an increase in control plane hardware investment. Most hardware controllers or chassis blades support approximately 150 APs and 4,000 users. A single instance of vWLAN supports thousands of users, APs, locations and even multiple customers—all without the need for any costly hardware controllers.

Security at the Edge
A conventional hardware controller-based wireless network allows unwanted traffic to enter the LAN and reach the controller. vWLAN uses intelligent APs that operate a stateful inspection firewall to enforce security at the edge - turning away all unwanted traffic and never allowing potential security risks to enter the network.

Optimized Performance
With vWLAN, system capacity is no longer dictated by the backplane capacity of the hardware-based controller; rather, it is determined by the aggregate throughput of the APs. A typical hardware controller-based WLAN solution has a fixed capacity and is limited in support to the APs available at the time the controller was designed. With the Bluesocket vWLAN approach, the control and data planes are separated and there is no need for a forklift upgrade as AP technology changes. As the next generation of 802.11ac Gigabit APs are released, the vWLAN architecture will scale to support them and any next-generation AP. This brings the added benefit of solution longevity, increased return on investment (ROI) and cost savings by eliminating the need to deploy new hardware.

Greater Flexibility
Virtualization enables greater efficiency, availability and flexibility of IT resources. vWLAN extends these same benefits to the WLAN. A single instance of vWLAN software deployed in one location can control and manage APs anywhere in the world or even across multiple customers. At the same time, ADTRAN’s Bluesocket vWLAN architecture can be used to deploy multiple service models including resale, hosted, managed, hotspot, mobile data offload, backhaul and high density. vWLAN can enable carriers to seamlessly move between various service models without any service disruption. This ensures customer satisfaction and an uninterrupted recurring revenue stream. This level of service flexibility, which is unprecedented in today’s market, widens the market for a service provider because it enables retention of customers who choose to transition between various services.

Sustainable Solution
Because ADTRAN’s Bluesocket vWLAN solution is a virtualized solution, it innately supports service providers’ sustainability initiatives. By eliminating the need for hardware controllers, this solution reduces both carbon footprint and power consumption.

Unified Access
The ADTRAN Bluesocket solution enables carriers to create a truly unified wired/wireless network by providing uniform service delivery, a seamless user experience and consistent authentication. Bluesocket vWLAN protects your customer’s previous investment by enabling a heterogeneous AP environment and a migration path from older APs. This blend-and-extend strategy is designed to deliver unparalleled flexibility.
Inherent Reliability, High Availability and Fault-Tolerant Environments

By separating the control and data planes, vWLAN is inherently more reliable than conventional hardware-based controller architectures. An interruption in the control plane does not interfere with the data plane. Therefore, reliability is based on the data center as opposed to a single-purpose hardware controller.

Our high-availability software is designed to provide failover with zero packet loss ensuring uninterrupted WLAN service—even during a control plane failover. The 1+1 high availability scheme does not require the addition of any new hardware. It is based on installing both primary and a secondary vWLAN software instances. vWLAN instances can be deployed anywhere in the world as long as the ADTRAN Bluesocket APs and both vWLAN instances have network connectivity to one another. High-availability coverage can be selectively assigned on a per-AP basis. In addition, high availability can be leveraged for software upgrades and control plane transfers between service models to eliminate downtime.

Wireless IDS

vWLAN includes a wireless intrusion detection system (IDS) which enables the service provider to provide value-added services for incremental revenue. From rogue access point detection to de-authentication floods, vWLAN can detect, alert, and report on more than 40 wireless IDS signatures.

Zero Touch AP Provisioning

Bluesocket APs automatically discover the vWLAN, download firmware and download configuration for a plug-and-play “zero configuration” deployment.

Dynamic RF

SMB and Enterprise IT departments may simply not have the time or expertise to deal with channel and transmit power selection. vWLAN’s radio resource management technology (RRM), Dynamic RF, automatically selects the appropriate channel and transmit power settings based on the RF environment—optimizing coverage and maximizing performance.

Class of Service (CoS) and Airtime Fairness

For service providers concerned with deploying wireless in an unlicensed spectrum, WLAN supports CoS at the edge of the network using three main components: over-the-air fairness, packet prioritization, and packet remarking allowing mission critical customer applications to be prioritized over best effort data.

Guest Access

vWLAN includes many guest access features which enable the service provider to offer value added services for incremental revenue, ranging from simple captive portal guest access where the guest enters an email address with no validation or clicks to accept terms and conditions, to more advanced options where lobby administrators, security personnel, or conference/training organizers can create accounts that automatically expire and print or even email/text customized receipts for validation. There is also the ability for authenticated users such as employees and students to sponsor guest accounts. Finally there is the ability to self sponsor guest accounts via captive portal and or kiosk.

Expanding Service Provider Opportunities with vWLAN

Managed and hosted WLAN represents a significant opportunity for service providers. Those utilizing ADTRAN’s carrier-class and highly scalable Bluesocket vWLAN technology now have the opportunity to bundle not just managed, but managed and hosted enterprise WLAN services with existing broadband access and managed service offerings. This enables new sources of recurring revenue, while providing the customer with added benefits. This solution also offers unparalleled scalability, ground breaking flexibility, simplified administration, and most importantly—substantially lower OPEX, CAPEX and Total Cost of Ownership (TCO).
In addition to the cost benefits afforded by the vWLAN architecture, it provides the ability to deliver a wide range of value-added services for incremental revenue. These include: planning and design, installation and integration, management and monitoring and guest access. With the addition of managed vWLAN to your portfolio, you will be able to present a complete solution to any business customer, while at the same time, solving many of your challenges with mobile data offload and small cell.

**Tight Integration with Complementary Systems**

vWLAN provides simplified integration, allowing service providers to streamline operations and rapidly generate revenue. Bluesocket vWLAN provides Application Programming Interfaces (APIs) that allow integration with existing provisioning systems, Web portals, management and monitoring systems and service provider’s or tenant’s on-premises authentication server (802.1x/EAP Server, Radius or LDAP).

**3G/4G Offload**

Wi-Fi networks can easily complement cellular networks, enabling operators to offload their highly congested cellular networks. Wi-Fi technology provides an inexpensive method to deliver data services. Operators can utilize a Wi-Fi network to reduce traffic congestion on the main network and to cost-effectively increase network capacity at specific locations. Wireline and cable providers can also use Wi-Fi networks to provide offload services and create new revenue streams by offering new applications.
Bringing the Power of Virtualization to Wi-Fi Offload

ADTRAN’s vWLAN Wi-Fi Offload solution provides a virtualized, carrier-grade, highly scalable architecture that complements existing fixed and mobile core networks. Implementation of the solution is seamless to both the subscriber and the mobile core, ensuring no disruption of service. ADTRAN’s Wi-Fi Offload solution offers operators a seamless extension of their 3G and 4G networks that is easy and economical to implement and maintain. This solution enables operators to increase their network capacity immediately at minimal cost, while providing the operator with complete control and management of the Wi-Fi offload network. Since the mobile data traffic that is offloaded to the Wi-Fi network never routes through the local cellular towers or into the operator’s mobile switching center, the vWLAN Wi-Fi Offload solution frees up costly cellular assets to be better utilized wherever the operator sees fit.

Seamless User Experience

ADTRAN is taking a leadership role in the development of standards that support carrier-grade Wi-Fi, including Passpoint (Hotspot 2.0), enabled through industry bodies such as the Wi-Fi Alliance (WFA), 3rd Generation Partnership Project (3GPP) and the Wireless Broadband Alliance (WBA). The ADTRAN vWLAN Offload solution employs the same subscriber authentication as the cellular mobile core. A connection manager on the subscriber’s phone is set to automatically detect and select a Wi-Fi network without user intervention. Supporting the same 3G/4G policy and charging functions, the Wi-Fi services are defined and managed exactly as if they were actual 3G/4G services on the cellular network. The vWLAN Offload solution uses the same security policies as the 3G/4G cellular network and leverages the existing Diameter PCRF/OCS/OFCS interfaces for authentication, policy control, charging control and roaming.

Small Cells

With the growing demand for mobile data, mobile network operators are increasingly turning to small cells—picocells, microcells, metrocels and femtocells—to deal with the capacity crunch in dense urban areas and to add coverage in areas with low or zero cellular signal levels, such as indoors and in remote rural locations. The capacity of small cells, which use licensed spectrum, is dependent on the availability of that limited spectrum, and can be degraded by interference between small cells. To cope with the limitations of small cells, service providers are turning to Wi-Fi. The Bluesocket vWLAN Wi-Fi solution allows service providers to leverage Wi-Fi to bridge the gap to LTE, while at the same time secure small cell deployment locations today and supplement LTE tomorrow.
Managed and Hosted Hotspots/Broadband Access

vWLAN technology can also be leveraged to deliver traditional hotspot offerings extending branded broadband services to public venues, retail, hotels, stadiums, airports, schools and libraries.

ADTRAN Custom Extended Services and Support

To ensure comprehensive, reliable, and secure vWLAN performance, ADTRAN Custom Extended Services (ACES) offers a suite of services designed to aid service providers in the planning, installation and on-going support of a customer's wireless network. These services are priced and structured to meet a service provider's unique needs. ACES offers three core services for vWLAN: site surveys, installation services and maintenance.
Site Surveys

Comprehensive Remote Site Survey
The Comprehensive Remote Site Survey is performed pre-installation and off-site by an ACES engineer using Wi-Fi site survey software simulating APs as well as antenna and building characteristics. It is designed to establish a comprehensive wireless design considering not only coverage, but also user capacity. Along with a bill of materials (BOM) it will determine the number of APs needed for the desired coverage areas, capacity, respective installation locations, heat maps depicting coverage, and a transmit power/channel plan. This survey is recommended for deployments that have high-capacity or high-density user requirements.

Post-Installation Onsite Survey
The Post-Installation Onsite Survey is a comprehensive passive and or active survey that is performed post-installation on-site by an ACES engineer using Wi-Fi site survey software to collect real-world data. It is designed to validate the results of the Comprehensive Remote Site Survey post-installation or to troubleshoot an existing ADTRAN wireless network. It includes identifying unforeseen coverage gaps, co/adjacent channel interference, and non-802.11 interference such as that from microwaves and heavy machinery.

Installations
Complementing the site survey, ACES network installation services help service providers cost-effectively and quickly deploy a high-performance, reliable wireless network. Whether a single-site or a complex multi-site, multi-location installation, ACES will assist a service provider with project management, configuration, installation, testing, and third-party vendor coordination, if required.

Remote Install
With a remote install, ACES will provide overall project management; gather data on the customer’s LAN and WAN environment and configuration needs. ACES will pre-configure the solution (optional) and remotely assist the service provider in installing and testing the equipment. Remote installs are ideal for service providers who are familiar with vWLAN and prefer to self-install the solution backed by the expertise of ADTRAN.

On-site Install
In addition to the services listed above, ACES will send an engineer on-site who will unpack, mount and configure the APs, connect the APs to the vWLAN server, and assist in conducting on-site solution testing. On-site installs are for service providers who prefer that ADTRAN manage the install as a turn-key project.

Maintenance
With ACES, service providers have the flexibility to design the appropriate level of support that fits their needs. ACES maintenance services include guaranteed rapid phone response provided by fully trained, certified and ready-to-assist technical experts. Depending on the level of service chosen, ACES provides 7x24 or 5x8 support coverage with Service Level Agreements (SLAs) ranging from 30 minutes to four hours, next-business day and four-hour remote or onsite product replacement, and access to the latest software releases.
The ADTRAN Difference

ADTRAN Bluesocket vWLAN offers industry-leading, carrier-class, highly scalable technology that service providers need to deliver profitable managed and hosted enterprise WLAN services. Customers of any size will benefit from the many distinct advantages offered by ADTRAN’s Bluesocket vWLAN Wi-Fi solution including: eliminating costly controllers, multi-tenant support, massive scale, security at the edge, performance, reliability, flexibility, sustainability, and tight integration with complementary systems, just to name a few. ADTRAN offers a remarkably low total cost of ownership, along with low CAPEX and OPEX, and the ability to deliver a wide range of value-added services for incremental revenue. In addition the ADTRAN Bluesocket vWLAN solution has the capability to support a broad range of other carrier applications such as 3G/4G offload, small cells, managed and hosted hotspots/broadband access and backhaul allowing the service provider to realize even further operational efficiencies. ADTRAN’s Bluesocket vWLAN solution offers the most innovative, cost-effective approach to WLAN with the greatest flexibility to meet the needs of any business customer. In addition, this solution drives higher monthly recurring charges (MRCs) than traditional hotspot offerings, while allowing you to utilize the same solution for mobile offload and small cell supporting your wireless strategy.
Featured Products
This robust portfolio of indoor and outdoor Wi-Fi APs and virtualized control and management address any operator deployment opportunity. Massively scalable and designed to integrate seamlessly with the operator's core network, the carrier-class Bluesocket vWLAN solution is comprised of:

vWLAN Virtual Appliance for VMware ESX/ESXi supports thousands of APs

1U vWLAN Appliance — Supports 1500 APs

BSAP-1920 Indoor AP for vWLAN; Dual radio, Dual Band (2.4GHz/5GHz) 802.11a/b/g/n with internal MIMO antenna array, 2x2:2. No external antenna connectors. Includes wall/ceiling mount kit. Requires IEEE 802.3af class 3 PoE or 12 volt AC/DC Power adapter, both sold separately.

BSAP-1925 Indoor AP for vWLAN; Dual Band (2.4GHz/5GHz) 802.11a/b/g/n with 4 RPSMA Jack connectors for external antennas, 2x2:2. No internal antenna. Includes wall/ceiling mounting kit. Requires external antennas sold separately. Requires IEEE 802.3af class 3 PoE or 12 volt AC/DC Power adapter, both sold separately.

BSAP-1930 Indoor AP for vWLAN; Dual radio, Dual Band (2.4GHz/5GHz) 802.11a/b/g/n with internal MIMO antenna array, 3x3:3. No external antenna connectors. Includes wall/ceiling mount kit. Requires IEEE 802.3af class 3 PoE or 12 volt AC/DC Power adapter, both sold separately.

BSAP-1935 Indoor AP for vWLAN; Dual Band (2.4GHz/5GHz) 802.11a/b/g/n with 6 RPSMA Jack connectors for external antennas, 3x3:3. No internal antenna. Includes wall/ceiling mounting kit. Requires external antennas sold separately. Requires IEEE 802.3af class 3 PoE or 12 volt AC/DC Power adapter, both sold separately.

BSAP-1940 Outdoor AP for vWLAN; BSAP-1940 Outdoor AP for vWLAN; Dual radio, Dual Band (2.4GHz/5GHz) 802.11a/b/g/n with 6 N-type connectors for external antennas, 3x3:3. Includes mounting kit. Requires IEEE 802.3at PoE sold separately. Requires external antennas sold separately.