



LigoWave



VAC&LAC

# DATASHEET



## 1. Product Overview

- 1.1. **VAC** (Virtual Access Controller) working as unified cloud platform for centralized management and monitoring, it is the brain of LigoWave's cloud Wi-Fi solution. It manages and monitors LAC devices, AP equipment, Wi-Fi rules, security rules, network resources, the client's roles and rights, and location and content service. VAC provides enterprises and ISPs with great convenience to access all the information about their clients and networks in real-time; based on this information, enterprises and ISPs only need to work on VAC platform to configure and adjust their networks and service instantly, sparing the need to travel around and touch any other network equipment. This facilitates enterprises and ISPs to create a new management model for user service and creates a new business model. Under VAC's centralized management, LAC and AP become truly plug-and-play, and the establishment and expansion of the network become very easy. Once the VAC is configured, ISPs and enterprises can gradually increase the number of LACs and APs deployed based on need, and seamlessly expand Wi-Fi network without changing network architecture.
- 1.2. Client and device information is collected in VAC. ISPs use this information to provide users with customized services based on location, such as portal customization, and advertising push. The enterprise can use its employees' location information to control their network access rights; this applies particularly to the network access control of the enterprise's partners.
- 1.3. Cloud based central management makes leveled-account based management and network leasing possible. Under VAC's management, it becomes very convenient for a network owner to create multiple virtual Wi-Fi networks, which can be managed and operated by different operators, to carry out the business of network leasing; the network owner can instantly lease a virtual network on demand, adjust network-wide resources in real-time, without the need to directly configure each LAC and AP. This cloud based central management model creates an account for each virtual network user to facilitate their management of the network resources which they rent from the network owner; this account also makes it possible for them to manage the clients who only connect to their virtual network.
- 1.4. Based on the location information from clients' logs on VAC, LigoWave's Wi-Fi solution can meet the network audit requirements of the government. With LigoWave's solution, the network auditing devices no longer need to be deployed at the network access layer. Client and device information is collected in VAC. ISPs use this information to provide users with customized services based on location, such as portal customization, and content push. An enterprise can use its employees' location information to control their network access rights; this particularly applies to network access control of the enterprise with different partners.
- 1.5. In the mobile Internet environment, the clients of different ISPs often need to use cross-network services; VAC provides flexible interface to interact with different ISPs' billing system.
- 1.6. **LAC** (Local Access Controller) is the execution device in LigoWave's Wi-Fi solution; it works as a distributed AC. Its function includes access control for APs and clients, safety rules enforcement, firewall, NAT, VPN, QoS and other network functions such as switching and routing. LAC is fully under VAC's control and capable of plug-and-play. This facilitates enterprises and ISPs to establish and expand their networks. LACs provide backup for each other; this rules out the risk of single point failure in the centralized AC.
- 1.7. LAC plays a very important role in LigoWave's network virtualization technology. A group of LACs on the internet creates a pool of physical network resources. VAC uses these resources to create different kinds of virtual networks on demand.



- 1.8. With the popularity of 802.11n, Wi-Fi network data transmission rate has been greatly increased, whereas centralized AC becomes a bottleneck in this situation. With LAC closer to APs, local forwarding of user data is easily achieved -- This has provided a very good solution to the problem.
- 1.9. Under VAC's unified control, different LACs can be connected across the internet with software controllable dynamic links, this can help the distributed enterprises to manage user data links based on roles and geographical characteristics. Also, this can help a chain business to establish a unified Wi-Fi private network across all the branches.

LAC can be in-line deployed at the access layer of an enterprise network. In this way, security enforcement can be pushed to the edge of the network, thus IT department is able to manage the access control of both wired and wireless networks at the same time

## 2. Key Features

### 2.1. Cloud based, easy to deploy

LigoWave's Wi-Fi network can be established across LAN, WAN and the Internet (NAT), When designing this centrally managed Wi-Fi network, the only requirement must be met is that AP, VAC and LAC are routable between each other (across NAT). Since this solution does not rely on any specific network access method, LigoWave Wi-Fi network can be built over various media, such as 3G, 4G, FTTH, Ethernet, CMTS, cable and so on. In this solution, AP and LAC are plug-and-play and can automatically form a network under the centralized management of VAC. User management can also cross LAN, WAN and Internet. Under the control of VAC, user management for enterprises can overcome regional and equipment limitations that has long troubled many enterprise IT departments.

### 2.2. Network Virtualization

The owner of a LigoWave Wi-Fi network can virtualizes one physical network into multiple virtual networks, which can be managed and operated by different operators. Each virtual network owner manages his virtual network through his account on VAC and has its own DHCP, Portal and authentication service.

### 2.3. Dynamic Wi-Fi VPN

With the surge of smart mobile device usage in exhibitions, conferences, celebrations and other public events, private information exchange through mobile devices becomes necessary, but it is not doable without a secure private Wi-Fi network. LigoWave's Wi-Fi solution can dynamically create virtual Wi-Fi VPN on demand to fulfill this requirement.

With LigoWave's Wi-Fi solution, an enterprise's VPN can be extended with LigoWave's portable APs carried by employees who travel around.

### 2.4. Content push based on AP' s physical location

When an AP registers to a VAC, its location information is saved by the VAC; based on the APs' location information, VAC can define different strategies to push useful content to the clients who access the APs at different locations.

## **2.5. Zero Configuration**

Deploying our AP is very simple and needs zero configuration. The user does not need to configure AP as the AP can be registered automatically and receives wireless rules set by VAC automatically – as long as VAC can be reached by IP routing.

## **2.6. Logging**

User login log, access log, online status, etc. can be accurately queried in real-time; this fully meets the auditing requirement of the Ministry of Public Security.

## **2.7. Role based bandwidth control**

Each user account on VAC has its own network bandwidth attribute, which controls how to allocate bandwidth based on the user's role.

## **2.8. Role based network access control**

In LigoWave's solution, the user's role is the foundation for user management. Each user account on VAC has a role attribute and corresponding right to access network resources. The user's role and right can be dynamically adjusted based on time and physical location.

## **2.9. Location tracking and location-based services**

VAC can associate user identity with the physical location information of the AP, which the user is accessing, to track the user's location and provide location-based services.

## **2.10. N +1 backup, automatic redundancy**

Under VAC's control, a group of LACs will back up each other; when a LAC fails, VAC will move all the APs and clients to other LACs.

## **2.11. Flexible user data forwarding mode**

AP supports both local forwarding mode and centralized forwarding mode, and AP can work in these two modes simultaneously.

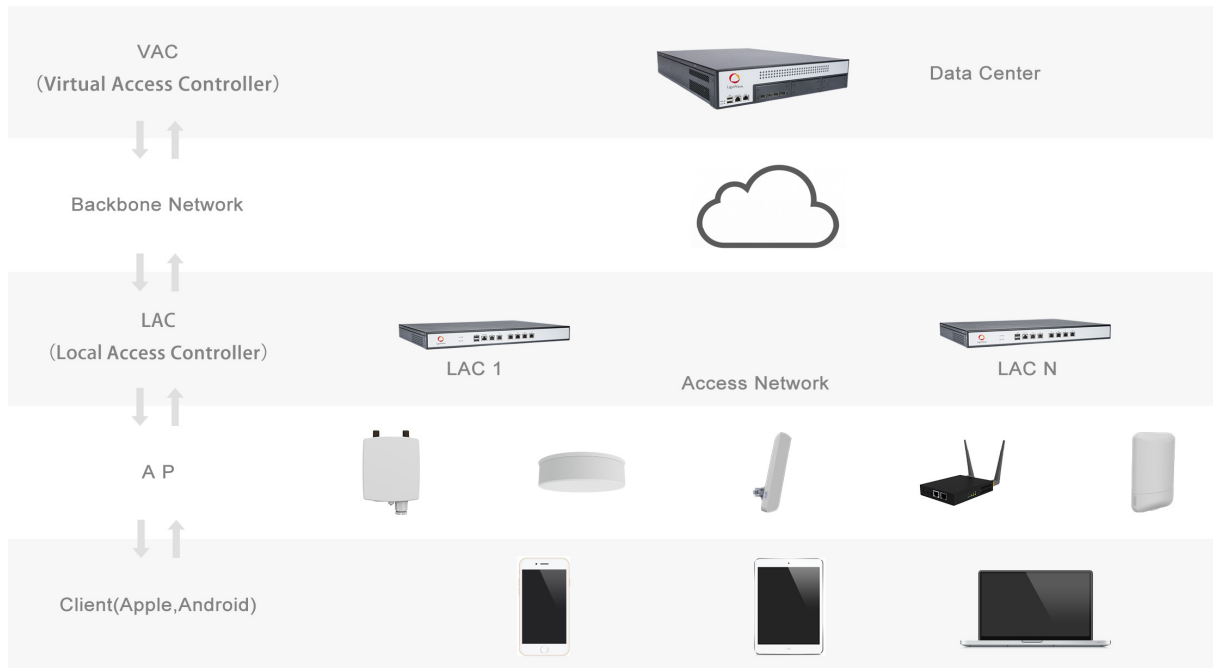
## **2.12. Intelligent RF Management**

Can manage RF channel, transmit power and other AP attributes across Internet.

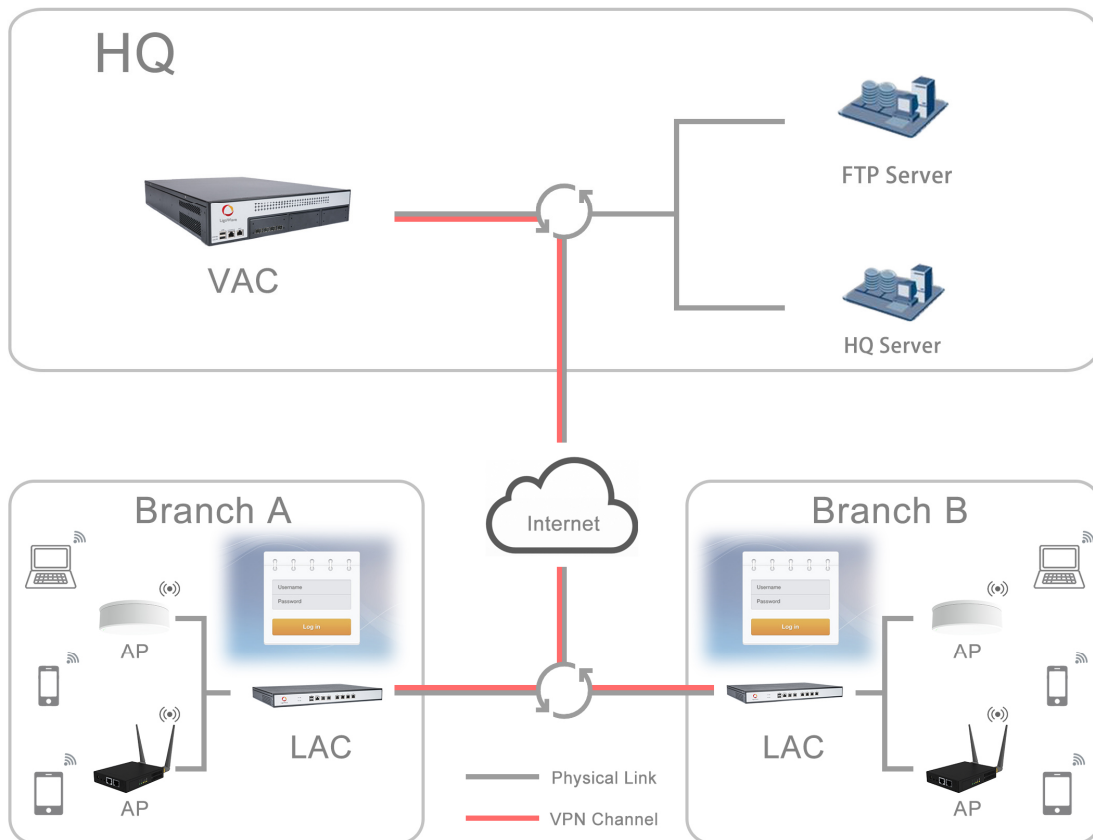
## **2.13. Layer 2 Seamless Roaming**

Users can roam between APs.

### 3. Network topology



### Typical Application: Chain Enterprise



## 4. Specification

### 4.1. VAC Hardware

Model		VAC-L32	VAC-L64	VAC-L128
Manage limit	LAC	32	64	128
	AP	1024	2048	4096
Console		1	1	1
10/100/1000Base-T		6	6	0
1000M SFP		0	0	4
USB 2.0		2	2	2
Weight		4kg	7kg	15kg
Power supply		220VAC , 100W		220VAC dual power , 400W
Operating temperature		0°C~40°C (32°F~104°F)		
Storage temperature		-20°C~80°C (-68°F~176°F)		
Humidity		10% ~ 90%(no condensation)		
Dimensions (1U=44.45mm)		320mm*450mm*1U	430mm*450mm*1U	424mm*565mm*2U

### 4.2. VAC Software Specification

Items	Specification
Cloud based	Connection between VAC, LAC and AP can cross internet
AP management	RF channel, RF transmits power, AP security policy, AP Remote Registry, AP location
LAC management	DHCP, Portal, NAT, Firewall, VPN, Bandwidth control, VLAN, Network virtualization
Authentication	Portal, Radius, LDAP, support both local and remote mode
Client management	Bandwidth, Billing by time and bytes, Location, Network access control
Content Service	Advertising push based on AP location
VPN	Manage L2TP/IPSEC connection between LAC and AP
Administration	HTTPS, CLI, SSH, Console and SNMP
Logging	Syslog, based on user identity, MAC/IP address, User location, AP Location
White/Black List	Based on IP address, MAC address and physical port

### 4.3. LAC Hardware

Model	LAC-E64	LAC-E128
Manage AP limit	64	128
Console	1	1
10/100/1000Base-T	4	6
USB2.0	2	2
Weight	4kg	4kg
Power supply	100~240V AC 100W	
Operating	0°C~40°C (32°F~104°F)	
Storage temperature	-20°C~80°C (-68°F~176°F)	
Humidity	10% ~ 90%(no condensation)	
Dimensions (1U=44.45mm)	438mm*330mm*1U	320mm*450mm*1U
Model	LAC-E512	LAC-E1024
Manage AP limit	512	1024
Console	1	1
10/100/1000Base-T	6	0
1000M SFP	0	4
USB2.0	2	2
Weight	7kg	15kg
Power supply	100~240VAC 100W	100~240VAC dual power400W
Operating temperature	0°C~40°C (32°F~104°F)	
Storage temperature	-20°C~80°C (-68°F~176°F)	
Humidity	10% ~ 90%(non condensation)	
Dimensions (1U=44.45mm)	430mm*450mm*1U	424mm*565mm*2U

#### 4.4. LAC Software specification

Items	Specification
<b>Access Control</b>	User role based, IP/MAC address based
<b>Bandwidth Control</b>	User role based, Protocol based, IP/MAC address based
<b>Security</b>	Firewall, VPN between LAC and AP
<b>Roaming</b>	Roaming within LAC and between LACs
<b>AP management</b>	Download WLAN policies to APs
<b>Statistic</b>	Time, bytes and packets
<b>Multicast</b>	IGMP Snooping
<b>Other Functions</b>	NAT、 Policy based routing、 VLAN、 DHCP、 ACL、 White/Black List

