

User's Guide
bintec R3000w / R3400 / R3800
Wireless LAN

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Purpose This document is part of the user's guide to the installation and configuration of bintec gateways running software release 7.3.1 or later. For up-to-the-minute information and instructions concerning the latest software release, you should always read our **Release Notes**, especially when carrying out a software update to a later release level. The latest **Release Notes** can be found at www.funkwerk-ec.com.

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Guidelines and standards bintec gateways comply with the following guidelines and standards:

R&TTE Directive 1999/5/EG

CE marking for all EU countries and Switzerland

You will find detailed information in the Declarations of Conformity at www.funkwerk-ec.com.

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1	Wireless LAN Menu	3
2	Wireless Interface Submenu	7
2.1	ACL Filter Submenu	14
2.2	IP and Bridging Submenu	15
3	WDS Link Configuration Submenu	19
4	Advanced	23
	Index: Wireless LAN	27

1 Wireless LAN Menu

The fields of the **WIRELESS LAN** menu are described below.

R3000w Setup Tool	Funkwerk Enterprise Communications GmbH
[WLAN-8-0]: Configure WLAN Interface	MyGateway
Operation Mode	Off
Location	Germany
Radio Band	2,4 GHz
Channel	auto
Wireless Interface >	
WDS Link Configuration >	
Advanced >	
SAVE	CANCEL

The **WIRELESS LAN** menu contains the general settings for the configuration of the gateway as an **access point (AP)**.

Wireless LAN (WLAN = Wireless Local Area Network) comprises the setup of a network by means of radio technology.

Network functions WLAN provides the same required network functions as a cabled network, i.e. access to servers, files, printers and mail system as well as the company Internet access. No cabling is required, so that with a WLAN no edificial constraints are to be considered (i.e. location of device is independent of position and number of connections).

Standard: 802.11 WLANs offer all functions of a cabled network. WLAN transmits indoors and outdoors at a maximum of 100 mW.
IEEE 802.11

IEEE 802.11g is presently the primarily used standard for radio-based LANs and offers a data transfer rate of 54 mbps. This method operates at a frequency of 2,4GHz (2400 MHz - 2485 MHz), which guarantees that buildings are penetrated with the required transmitting power that, however, does not affect health.

802.11b is compatible with 802.11g, operating with 2,4 GHz (2400 MHz - 2485 MHz) and offering a data transfer rate of 11 Mbps. 802.11g and 802.11b WLAN systems are free of charge and are not to be registered.

With 802.11a data transfer rates up to 54 Mbps can be used inbetween 5150 MHz - 5725 MHz. Due to the greater frequency range 19 frequencies are available (in Germany). This frequency range is not to be registered, too. In Europe a transmitting power of 1000 mW is available with 802.11h, but has to be applied with TPC (TX Power Control, methode to control the transmitting power of radio equipment to reduce interferences) and DFS (Dynamic Frequency Selection). TPC and DFS are applied to avoid interferences with satellite communication and radar equipment.

The **WIRELESS LAN** menu consists of the following fields:

Field	Description
Operation Mode	Defines, whether the gateway operates as access point (<i>Access Point</i>) or not (<i>Off</i> , default value).
Location	The country setting of the AP. Possible values are all countries preconfigured on the wireless module of the gateway. The range of the optional channels differs according to the country setting selected. Default value is <i>Germany</i> .
Radio band	Frequency range the access point is to operate in. Possible values: <ul style="list-style-type: none"> ■ 2,4 GHz (default value): in ADVANCED WIRELESS → WIRELESS MODE you can choose from different WLAN standards. <i>802.11 mixed</i> is used per default. ■ 5 GHz

Field	Description
Usage area	<p>Only for RADIO BAND = 5 GHz</p> <p>Installation location of the access point.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>anywhere</i> (default value): The access point is to operate indoors and outdoors. ■ <i>indoor</i>: The access point is to operate indoors. ■ <i>outdoor</i>: The access point is to operate outdoors.
Channel	<p>The channel used by the AP.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>1 ... 13</i>: only for RADIO BAND = 2,4 GHz ■ <i>auto</i> (default value): the channel is detected automatically; single option for RADIO BAND = 5 GHz.

Table 1-1: **WIRELESS LAN** menu fields

The menu provides access to the following submenus:

- **WIRELESS INTERFACE**
- **WDS LINK CONFIGURATION**
only for **RADIO BAND = 2,4 GHz**
- **ADVANCED**

2 Wireless Interface Submenu

The fields of the *WIRELESS INTERFACE* menu are described below.

R3000w Setup Tool		Funkwerk Enterprise Communications GmbH		
[WLAN-8-0] [WIRELESS]: Interface List				MyGateway
Network Name	Status	Security	ACL-Filter	if Cl.#
*Funkwerk-ec	enable	NONE	disable	vss8-0 16
ADD		DELETE		EXIT

The **WIRELESS LAN → WIRELESS INTERFACE** submenu displays a list with already configured wireless interfaces and contains essential settings such as network name, status, security mode etc. The '*' in front of the **NETWORK NAME** (▶▶ **SSID**) means that the network name is visible on ▶▶ **active probing**.

Each wireless interface (with prefix ▶▶ **vss**) has its own IP settings and can use all standard interface specific features such as QoS, Stateful Inspection, Accounting, Access Lists, NAT etc. This opens a wide range of applications for the WLAN interface.

The bintec WLAN gateway not only offers bridging for wireless connections, but is also fully integrated into the routing environment.

Securing your WLAN

Security As WLAN uses the air as transmission medium, the transferred data can theoretically be intercepted and read by anyone with the respective means. Thus, safeguarding the radio link is to be paid special attention.

- WEP** 802.11 defines the security standard WEP (Wired Equivalent Privacy = data encryption with 40/64 bit (**SECURITY MODE = WEP 40/64**) resp. 104/128 bit (**SECURITY MODE = WEP 104/128**)). The commonly used WEP, however, turned out to be vulnerable. For increased security you have to configure hardware-based encryption (as e.g. 3DES or AES) additionally. Thus even sensitive data can be transferred via the WLAN.
- IEEE 802.11i** The IEEE 802.11i standard for wireless systems comprises security specifications for radio networks especially concerning encryption. The relatively unsecure WEP (Wired Equivalent Privacy) is replaced by WPA (Wi-Fi Protected Access). In addition, the Advanced Encryption Standard (AES) is defined for data encryption.
- WPA** WPA (Wi-Fi Protected Access) offers increased protection by means of dynamic keys, which are based on the Temporal Key Integrity Protocol (TKIP), and offers PSK (Pre-Shared-Keys) or Extensible Authentication Protocol (EAP) via 802.1x (e.g. via RADIUS) for the authentication of users.
- The authentication via EAP is normally used in vast Wireless LAN installations, because it requires an authentication server (e.g. a RADIUS server). In smaller networks, mostly for SoHo (Small Office, Home Office), PSK (Pre-Shared-Keys) are normally used. All participants of the Wireless LAN must thus know the PSK, as the session key is generated by means of it.
- WPA2** WPA2 is the successor of WPA. It implements the full 802.11i-standard and uses the encryption algorithm AES (Advanced Encryption Standard).
- Security options** To safeguard the data transferred via WLAN you should if applicable configure the options of the **WIRELESS LAN → WIRELESS INTERFACE** menu:
- Change the default SSID, **NETWORK NAME = Funkwerk-ec**, of your access point.
 - Set **WIRELESS INTERFACE → NAME IS VISIBLE = no**. Thus all WLAN clients are refused who try to connect with the common **NETWORK NAME** (SSID) Any and do not know the specified SSIDs.
 - Use one of the provided encryption methods by selecting **SECURITY MODE = WEP 40/64, WEP 104/128, WPA PSK** or **WPA 802.1x** with TKIP (WPA) or AES (WPA2) or both, and entering the respective key for the access point into **KEY 1 - 4** resp. **ENTER PRESHARED KEY** and for the WLAN clients.

- The WEP key should regularly be changed by modifying the **DEFAULT KEY**. Chose the longer WEP key with 104/128 bits.
- To transfer highly sensitive data it is recommended to select **SECURITY MODE = WPA 802.1x** with **WPA/WPA2 MIXED MODE = WPA2 only**. These methods comprise hardware based encryption and RADIUS authentication of the client. In special cases even a combined operation with IPSec is possible.
- Limit the access to the WLAN for allowed clients by entering the MAC addresses of the WLAN cards of these clients into the **MAC FILTER → ACCEPT** list. All other clients are rejected and listed under **REJECT**.

The generation of new wireless interfaces is carried out in **WIRELESS LAN → WIRELESS INTERFACES → ADD**:

R3000w Setup Tool	Funkwerk Enterprise Communications GmbH
[WLAN-8-0] [WIRELESS] [ADD]: Wireless Interface	MyGateway
AdminStatus	enable
Network Name	
Name is visible	yes
Max. Clients	16
Security Mode	NONE
SAVE	CANCEL

The adjustment of already configured wireless interfaces is carried out in **WIRELESS LAN → WIRELESS INTERFACES → EDIT**:

R3000w Setup Tool	Funkwerk Enterprise Communications GmbH
[WLAN-8-0] [WIRELESS] [EDIT]: Wireless Interface	MyGateway
AdminStatus	enable
Network Name	Funkwerk-ec
Name is visible	yes
Max. Clients	16
Security Mode	NONE
ACL Filter >	
IP and Bridging >	
SAVE	CANCEL

The **WIRELESS LAN** → **WIRELESS INTERFACE** menu consists of the following fields:

Field	Description
AdminStatus	<p>Defines the administrative status of the wireless interface.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>enable</i> (default value): enable the interface ■ <i>disable</i>: disable the interface
Network Name	<p>Name of the wireless interface (SSID).</p> <p>Enter an ASCII string of max. 32 characters.</p>
Name is visible	<p>Enable broadcasting of the network name (SSID) of the wireless interface.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>yes</i> (default value): network name is visible for clients within reach. ■ <i>no</i>: network name is hidden for the clients.

Field	Description
Max. Clients	Maximum number of client connections allowed defined for this interface. Maximum 64 connections can be distributed to all wireless interfaces.
Security Mode	<p>The security mode (encryption and authentication) of the wireless interface.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>NONE</i> (default value): no encryption or authentication ■ <i>WEP 40/64</i>: WEP 40Bit ■ <i>WEP 104/128</i>: WEP 104Bit ■ <i>WPA PSK</i>: WPA with Preshared Key authentication ■ <i>WPA 802.1x</i>: WPA with EAP (RADIUS-authentication) <p>If SECURITY MODE is set to <i>WPA 802.1x</i> the following note is displayed: <i>A Radius Server configuration in RADIUS setup is required.</i></p>
Default Key	<p>Only for SECURITY MODE = <i>WEP 40/64</i>, <i>WEP 104/128</i></p> <p>Here you select one of the configured keys in KEY <1 - 4> to be the one used as default key. Default value is Key 1.</p>

Field	Description
Key <1 - 4>	<p>Only for SECURITY MODE = WEP 40/64, WEP 104/128</p> <p>Here you enter the WEP key. WEP keys can be entered in two different ways:</p> <ul style="list-style-type: none"> ■ Direct Digit Input in hexadecimal format Starting the key with <i>0x</i>, disables the generator. Enter the key with the exact count of hexadecimal digits for the selected WEP mode. 10 digits for WEP40 or 26 digits for WEP104. E.g. WEP40: <i>0xA0B23574C5</i>, WEP104: <i>0x81DC9BDB52D04DC20036DBD831</i> ■ Direct ASCII based input Starting the key with <i>"</i>, disables the generator. Enter a string with the exact count of characters for the selected WEP mode. The phrase ends with <i>"</i>. For WEP40 the phrase must have 5 characters, for WEP104 13 characters. E.g. <i>"hallo"</i> for WEP40 <i>"funkwerk-wep1"</i> for WEP104.

Field	Description
Enter Preshared Key	Only for SECURITY MODE = WPA PSK Here you enter the WPA passphrase. Enter an ASCII String of 8 - 64 characters.
WPA/WPA2 mixed mode	Only for SECURITY MODE = WPA PSK and WPA 802.1x Here you select whether to apply WPA (with TKIP encryption) or WPA2 (with AES encryption) or both. Possible values: <ul style="list-style-type: none"> ■ WPA + WPA2 (default value) ■ WPA only ■ WPA2 only
WPA2 preauthentication	Only for SECURITY MODE = WPA 802.1x with WPA/WPA2 MIXED MODE = WPA + WPA2 and WPA2 only With this option registered clients can pre authenticate at other access points in the same radio cell. Thus these clients can change faster to the other access point ("roaming"), as the RADIUS authentication can be omitted during registration. The preauthentication is only possible with the client being registered at the access point with WPA2. Possible values: <ul style="list-style-type: none"> ■ enabled: The Access Point allows preauthentication of clients at other access points. ■ disabled (default value): Preauthentication requests of clients are ignored.

Table 2-1: **WIRELESS INTERFACES** menu fields

2.1 ACL Filter Submenu

The fields of the **ACL FILTER** submenu are described below.

```

R3000w Setup Tool                Funkwerk Enterprise Communications GmbH
[WLAN-8-0] [WIRELESS] [EDIT] [ACCESS LIST]: Interface      MyGateway
                                      <Funkwerk-ec>

AdminStatus                disable

Accept Address                ADD

----- ACCEPT                REJECT -----

Press 'a' to move selected Reject Address to Accept List.

SAVE                REMOVE                EXIT                REFRESH
  
```

In the **WIRELESS LAN → WIRELESS INTERFACES → MAC FILTER** submenu, hardware specific access control is configured. Thus it is possible to allow only specific clients to access the access point. This filter is checked before any other security mechanism is activated. The entered addresses are MAC based.

MAC Address Lists The **ACCEPT** list displays all MAC addresses to be accepted for the wireless interface.

The **REJECT** list displays all rejected addresses.

Default behaviour: If **ADMINSTATUS** = *disabled*, all clients are accepted. As soon as **ADMINSTATUS** = *enabled* is set and no MAC address is listed in the **ACCEPT** list, all clients are blocked. Only those clients whos MAC addresses are then entered manually into the **ACCEPT** list or are moved from the **REJECT** to the **ACCEPT** list are accepted.

Additional buttons The **REFRESH** button reloads the **REJECT** list, so that at any time the current status of rejects can be listed.

With the **REMOVE** button selected addresses can be deleted from the **ACCEPT** list. Removing an address from the **ACCEPT** list immediately disconnects an established link.

The menu consists of the following fields:

Field	Description
AdminStatus	Enable or disable the filter for this wireless interface. Possible values: <i>enable</i> , <i>disable</i> (default value)
Accept Address	Enter a MAC address to be accepted. Possible values: 12 digit MAC addresses; the addresses are entered without any ":". Press ADD to add the entered MAC address to the ACCEPT list. If you highlight an entry from the REJECT list and press a (must be lowercase) on your keyboard, the respective entry is moved to the ACCEPT list. Thus you do not have to manually enter acceptable addresses.

Table 2-2: **ACL FILTER** menu fields

2.2 IP and Bridging Submenu

The fields of the **IP AND BRIDGING** submenu are described below.

R3000w Setup Tool		Funkwerk Enterprise Communications GmbH	
[WLAN-8-0] [WIRELESS] [EDIT] [IP CONFIGURATION]: WLAN VSS		MyGateway	
Interface <Funkwerk-ec>			
local Communication		disabled	
Local IP Address			
Local Netmask			
Second Local IP Address			
Second Local Netmask			
Bridging enable		no	
Proxy ARP		no	
SAVE		CANCEL	

In the **WIRELESS LAN → WIRELESS INTERFACES → ADD/EDIT → IP AND BRIDGING** submenu you enter the interface specific IP configuration and activate the bridging mode if applicable.

The menu consists of the following fields:

Field	Description
local communication	Allows the communication between the clients, authenticated at this SSID, to e.g. access common shares. Possible values: <i>enabled</i> , <i>disabled</i> (default value)
Local IP Address	Here you assign an IP address to the wireless interface.
Local Netmask	Netmask for LOCAL IP NUMBER .
Second Local IP Address	Here you assign a second IP address to the wireless interface.
Second Local Netmask	Netmask for SECOND LOCAL IP NUMBER .

Field	Description
Bridging enable	Defines the operatin mode of the wireless interface. Possible values: <ul style="list-style-type: none">■ <i>no</i> (default value): Routing is enabled on the wireless interface.■ <i>yes</i>: Bridging is enabled on the wireless interface.
Proxy ARP	Enables the gateway to answer ARP requests from its own LAN acting for a defined WAN partner. Possible values: <i>on</i> , <i>off</i> (default value).

Table 2-3: **IP AND BRIDGING** menu fields

3 WDS Link Configuration Submenu

The fields of the *WDS LINK CONFIGURATION* menu are described below. (The screenshot shows example values.)

R3000w Setup Tool		Bintec Access Networks GmbH		
[WLAN-8-0] [WDS LINK]: WDS List		MyGateway		
MAC Address	Local-IP	Remote-IP	Network/Mask	Ena.
00:12:76:4c:3a:02	1.1.2.1	1.1.2.2	172.16.33.0/24	yes
00:c0:12:ba:c4:50	1.1.1.1	1.1.1.2	172.16.22.0/24	yes
ADD		DELETE		EXIT

The **WIRELESS LAN → WDS LINK CONFIGURATION** menu shows a list of all configured WDS (Wireless Distribution System) Links.

The menu is only displayed for **RADIO BAND = 2,4 GHz**.

WDS links are static links between access points (AP). These links are used in general to connect clients to networks which cannot be reached directly, e.g. because of long distances. The AP sends data from one client to another AP that transfers the data then to the other client.



Note that traffic sent between access points in an WDS link is transferred unencrypted. We strongly recommend the use of IPSec to secure traffic in WDS links.

WDS links are configured as interfaces with the prefix *wds*. They operate in the same way as the VSS interfaces, differing, however, by predefined routing. A

WDS link is configured as transfer network: it is a point-to-point or a point-to-multipoint connection between two gateways serving different networks.

The list contains the following descriptions

Column	Content
MAC Address	MAC address of the destination WDS link. (= REMOTE WDS MAC ADDRESS in WDS LINK CONFIGURATION → ADD/EDIT)
Local IP	The IP address of the local WDS interface. (= LOCAL IP-ADDRESS in WDS LINK CONFIGURATION → ADD/EDIT)
Remote IP	The IP address of the destination WDS interface. (= PARTNER IP-ADDRESS in WDS LINK CONFIGURATION → ADD/EDIT)
Network/Mask	The destination network which is connected via this WDS link to the destination AP via Ethernet or Wireless LAN. (= REMOTE NETWORK & REMOTE NETMASK → ADD/EDIT)
Ena.	The link is enabled (<i>yes</i>) or not (<i>no</i>). (= ADMINSTATUS in WDS LINK CONFIGURATION → ADD/EDIT)

Table 3-1: WDS List

The configuration of the WDS links is carried out in the **WIRELESS LAN → WDS LINK CONFIGURATION → ADD/EDIT** submenu.

R3000w Setup Tool	Bintec Access Networks GmbH
[WLAN-8-0] [WDS LINK] [ADD] : WDS Link	MyGateway
AdminStatus	enable
Mode	transient routing
Remote WDS MAC Address	
Local IP-Address	
Partner IP-Address	
Remote Network	
Remote Netmask	
SAVE	CANCEL

The menu consists of the following fields:

Field	Description
AdminStatus	Status of the WDS link. Possible values: <i>enable</i> (default value), <i>disable</i>
Mode	Selection of mode the WDS link is to operate in. Possible values: <ul style="list-style-type: none"> ■ <i>transient routing</i> (default value): IP Routing to a destination host or network including any transit network available. ■ <i>bridging</i>: Bridging mode activated. ■ <i>routing</i>: IP Routing to a destination host or network not including any transit network available.
Remote WDS MAC Address	MAC address of the destination WDS link.

Field	Description
Local IP-Address	Only for MODE = routing or transient routing IP address of the local WDS interface.
Local Netmask	Only for MODE = routing Netmask for IP-ADDRESS
Partner IP-Address	Only for MODE = transient routing IP address of the destination WDS interface.
Remote Network	Only for MODE = transient routing The destination network which is connected via this WDS link to the destination AP via Ethernet or Wireless LAN.
Remote Netmask	Only for MODE = transient routing Netmask for REMOTE NETWORK .

Table 3-2: **WDS LINK CONFIGURATION** → **ADD/EDIT** menu fields

4 Advanced

The fields of the **ADVANCED** menu are described below.

R3000w Setup Tool	Funkwerk Enterprise Communications GmbH
[WLAN-8-0] [ADVANCED]: WLAN Specific Settings	MyGateway
Wireless Mode	802.11 mixed
Maximum Bitrate	AUTO
NITRO Burst	off
TX Power (dBm)	17
Timeout (minutes)	5
SAVE	CANCEL

In the **WIRELESS LAN** → **ADVANCED** menu you will find WLAN specific settings. Changes, however, are not necessary in general.

The menu consists of the following fields:

Field	Description
Wireless Mode	<p>Only for WIRELESS LAN → RADIO BAND = 2,4 GHz</p> <p>Operating mode of the AP.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>802.11g</i>: 54Mbit Clients only ■ <i>802.11b</i>: 11Mbit Mode only ■ <i>802.11 mixed</i> (default value) / <i>802.11 mixed short</i>: 11Mbit and 54Mbit mixed mode ■ <i>802.11 mixed long</i>: 11Mbit and 54Mbit mixed mode with long preamble. This mode is required for clients that only support 1 and 2 mbps. It is also used for Centrino Clients if there are connecting problems.
Maximum Bitrate	<p>The maximum Bitrate from/to a client.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>AUTO</i> (default value) ■ Chose a predefined value in the range of 1 up to 54 Mbit

Field	Description
NITRO Burst	<p>This feature increases the maximum burst time for the transmission to a connected station, thus increasing the throughput in slower WLANs.</p> <p>Several WLAN data packets are sent consecutively ("Burst"). The necessary CTS packet for administration is only required once. Choosing an option defines the maximum time this packet burst is to last.</p> <p>Possible values:</p> <ul style="list-style-type: none"> ■ <i>Off</i> (default value): 0 (= no Burst) ■ <i>Compatible</i>: Burst Time = 0.65ms ■ <i>Ideal</i>: Burst Time = 1.3ms ■ <i>Maximum</i>: Burst Time = 5ms <p>NITRO Burst conforms with the 802.11 standards, i.e. the with NITRO Burst mode data traffic enhancements can be reached with each 11g-compatible client.</p> <p>If problems arise with older WLAN hardware, set to <i>off</i>.</p>
TX Power (dBm)	<p>TX output from the AP in dBm.</p> <p>Possible values: 1 to 18.</p> <p>Default value is 17.</p>
Timeout (minutes)	<p>Broken link detection: Here you can set the time after which a client is automatically disconnected if no signal has been received.</p> <p>Possible values: 1..240 Minutes</p> <p>Default value is 5.</p>

Table 4-1: **ADVANCED** menu fields

Index: Wireless LAN

Numerics	802.11 b/g mixed	24
A	Accept Address	15
	Access Point	4
	ACL Filter	14
	Active Probing	7
	AdminStatus	10, 15, 21
B	Bridging enable	17
C	Channel	5
D	Default Key	11
E	Ena.	20
	Enter Preshared Key	13
K	Key	12
L	local communication	16
	Local IP	20
	Local IP-Address	22
	local IP-Number	16
	Local Netmask	22
	local Netmask	16
	Location	4
M	MAC Address	20
	Max. Clients	11
	Maximum Bitrate	24
	Mode	21
N	Name is visible	10

	Network Name	10
	Network/Mask	20
	NITRO Burst	25
O	Operation Mode	4
P	Partner IP-Address	22
	Proxy ARP	17
R	Radio band	4
	Remote IP	20
	Remote Netmask	22
	Remote Network	22
	Remote WDS MAC Address	21
S	Second Local IP-Number	16
	Second Local Netmask	16
	Security Mode	11
	SSID	10
T	Timeout (minutes)	25
	TX Power (dBm)	25
U	Usage area	5
V	vss	7
W	wds	19
	WEP	8
	Wireless Mode	24
	WPA	8
	WPA/WPA2 mixed mode	13
	WPA2 preauthentication	13