LINKSYS®

User Guide

LAPN300

Wireless-N300

Access Point with POE

Model LAPN300

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Chapter 1 - LAPN300

Package Contents

- Linksys Wireless Access Point
- Quick Start Guide
- Ethernet Cable
- AC Power Adapter
- CD with Documentation
- Mounting Bracket
- Mounting Kit
- Ceiling Mount Back Plate
- Drilling Layout Template

Physical Details

- LED—There is one LED for the device.

LED Color	Activity	Status
Green	Blinking	System is booting.
	Solid	System is normal; no wireless device connected.
Blue	Blinking	Software upgrade in process.
	Solid	System is normal; at least one wireless device connected.
Red	Solid	Booting process or update failed; hard reset or service required.

Ports and Button

- Power Port—Connect the AC power adapter to this port.
    - NOTE: Use only the adapter that came with your access point.
- Ethernet Port—Connect a wired network device to this port. This port supports PoE (Power over Ethernet) with a PoE switch or PoE injector. The maximum power consumption for LAPN300 is 12.5 W. Make sure your PoE switch or PoE injector is 802.3af-capable or 802.3at-capable to provide sufficient power to access point.

    - NOTE: When both PoE and AC power adapter are connected to access point, device will get power from PoE as higher precedence.
    - Using Cat5e or better cable is highly recommended.
- Reset Button—Press and hold this button for less than 15 seconds to power cycle device. Press and hold for longer than 15 seconds to reset the device to factory default settings.

Mounting Guide

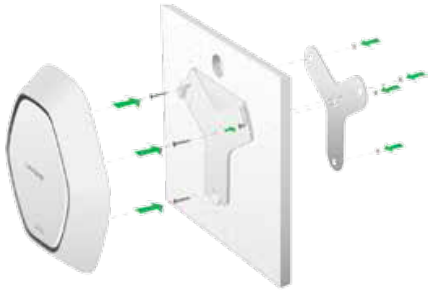
To avoid overheating, do not install your access point if ambient temperatures exceed 104°F (40°C). Install on a flat, stable surface, near the center of your wireless coverage area making sure not to block vents on the sides of the device enclosure.

Wall Installation

1. Position drilling layout template at the desired location.
2. Drill four screw holes on the mounting surface. If your Ethernet cable is routed behind the wall, mark Ethernet cable hole as well.
3. Secure the mounting bracket on the wall with anchors and screws.
4. If your Ethernet cable is routed behind the wall, cut or drill the Ethernet cable hole you marked in Step 2. Feed the Ethernet cable through the hole.
5. Connect the Ethernet cable and/or AC power adapter to your device.
6. Slide the device into the bracket. Turn clockwise until it locks into place.

Ceiling Installation

1. Select ceiling tile for mounting and remove tile.
2. Position drilling layout template at the desired location.
3. Drill four screw holes and Ethernet cable hole on the surface of ceiling tile.
4. Place back plate on the opposite side of ceiling tile. Secure mounting bracket to the ceiling tile with flathead screw and nut. Route the Ethernet cable through the Ethernet cable hole.



5. Connect the Ethernet cable and/or AC power adapter to your device
6. Slide the device into the bracket. Turn access point clockwise until it locks.
7. Replace tile in ceiling.

IMPORTANT—Improper or insecure mounting could result in damage to the device or personal injury. Linksys is not responsible for damages caused by improper mounting.

Chapter 2 – Access Point Setup

Overview

This chapter describes the setup procedure to connect the wireless access point to your LAN, and configure it as an access point for your wireless stations.

Wireless stations may also require configuration. For details, see Appendix C - Wireless Station Configuration.

The wireless access point can be configured using a web browser.

Set up using a web browser

Your browser must support JavaScript. The configuration program has been tested on the following browsers:

- Firefox 3.5 or later, Chrome 8 or later, Safari 5 or later
- Internet Explorer 7 or later

Setup Procedure

Make sure device is powered on before you continue setup. If LED light is off, check that AC power adapter, or PoE cable, is properly connected on both ends.

Access device's browser-based setup:

1. Use the included cable to connect the access point to your network via a network switch or router.
2. Open a web browser on a computer connected to your network. Enter the IP address of your access point. By factory default, the IP address will be assigned by a DHCP server (usually the network router). If there is no DHCP server on your network, the default IP address is 192.168.1.252/255.255.255.0.

   Note—Use a computer hardwired to the same network as your access point for browser-based setup access. Access to browser-based setup via Wi-Fi is disabled by default.

3. Type in default username: admin, and password: admin.
4. Click **Login** to launch the browser-based setup and follow the on-screen instructions.

Figure 1: Password Dialog

If you can't connect—It is likely that your PC's IP address is incompatible with the wireless access point's IP address. This can happen if your LAN does not have a DHCP Server. If there is no DHCP server in your network, the access point will fall back to its default IP address: 192.168.1.252, with a network mask of 255.255.255.0.

OR

If your PC's IP address is not compatible with this, you must change your PC's IP address to an unused value in the range 192.168.1.1 ~ 192.168.1.254, with a network mask of 255.255.255.0. See Appendix A - Windows TCP/IP for details for this procedure.

Setup wizard

The first time you connect to the wireless access point, run the Setup Wizard to configure the device.

1. Click the *Quick Start* tab on the main menu.

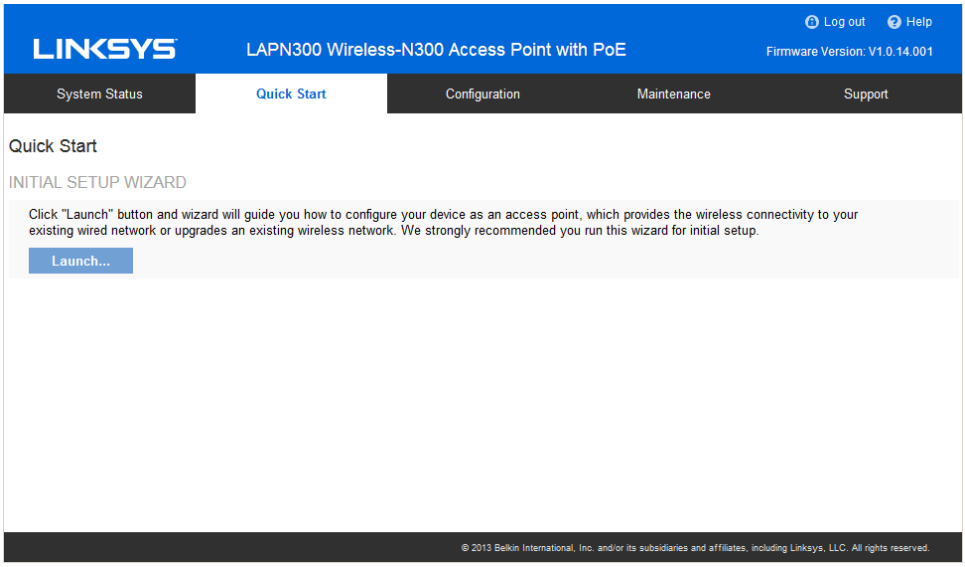


Figure 2: Setup Wizard

2. On the first screen, click **Launch**.
3. Set the password on the *Device Password* screen, if desired.

4. Configure the time zone, date and time for the device on *System Settings* screen.

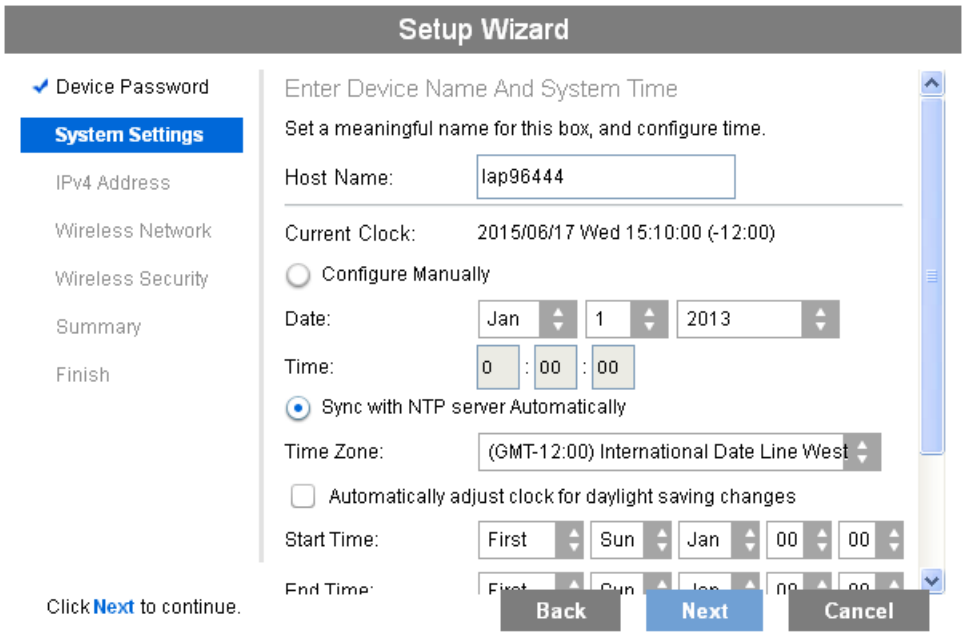


Figure 3: Setup Wizard - System Settings

5. On the *IPv4 Address* screen (Figure 4) configure the IP address of the device then click **Next**.

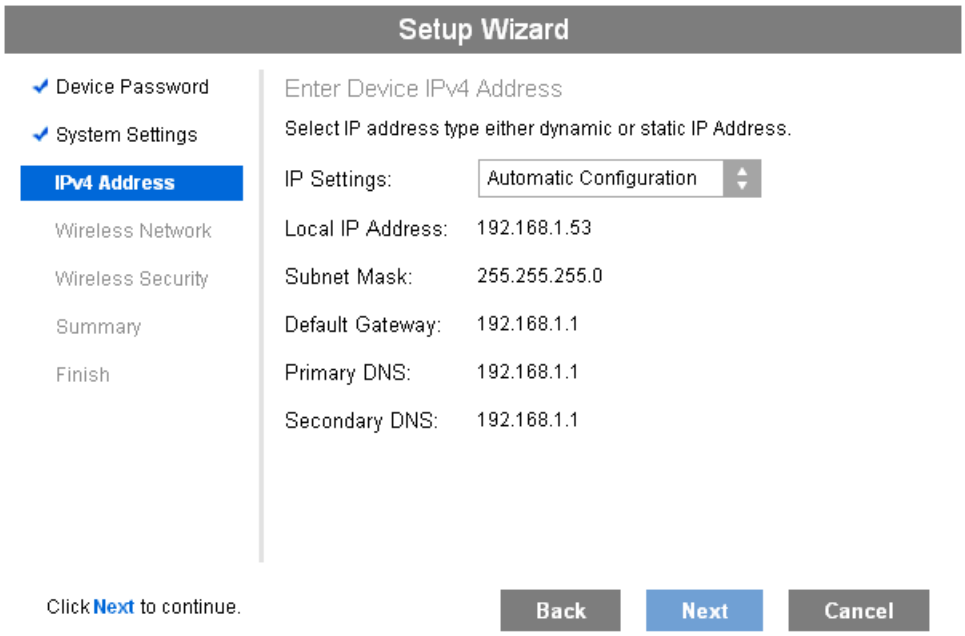


Figure 4: Setup Wizard - IPv4

6. Set the SSID information on the *Wireless Network* screen. Click **Next**. If you want to configure more than 4 SSIDs, go to *Configuration* > *Wireless* >*Basic Settings*. The access point supports up to 8 SSIDs.

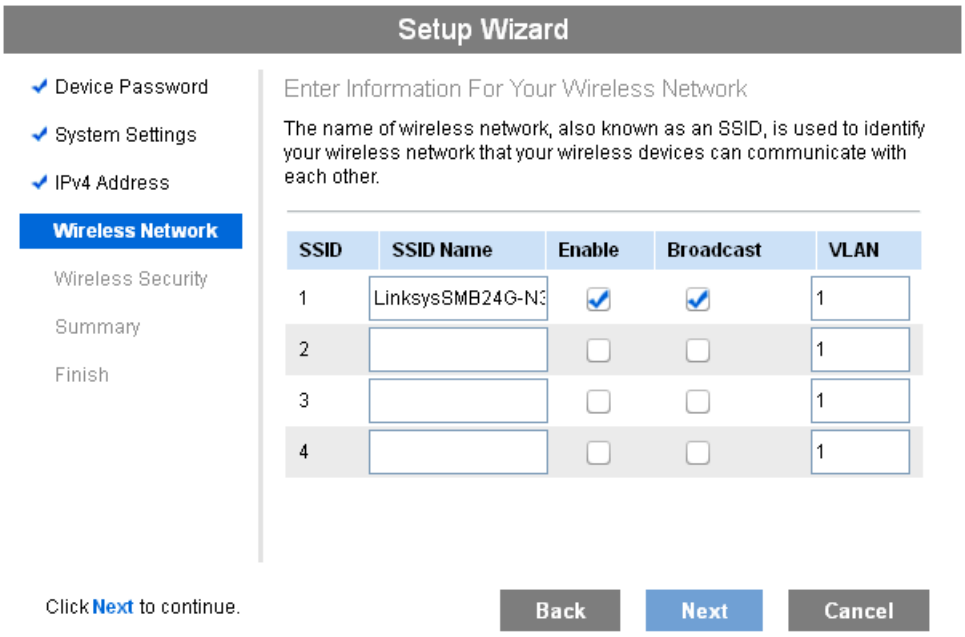


Figure 5: Setup Wizard - Wireless Network

7. On the *Wireless Security* screen (Figure 6) configure the wireless security settings for the device. Click **Next**. If you are looking for security options that are not available in the wizard, go to *Configuration* > *Wireless* > *Security* page. The access point supports more sophisticated security options there.

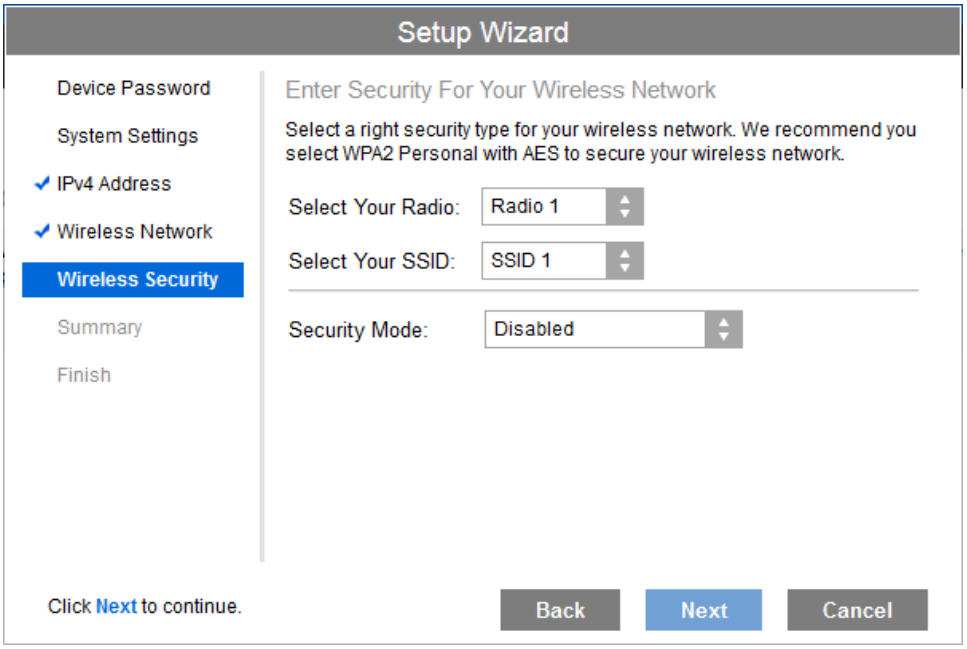


Figure 6: Setup Wizard - Wireless Security

8. On the Summary screen, check the data to make sure they are correct and then click **Submit** to save the changes.

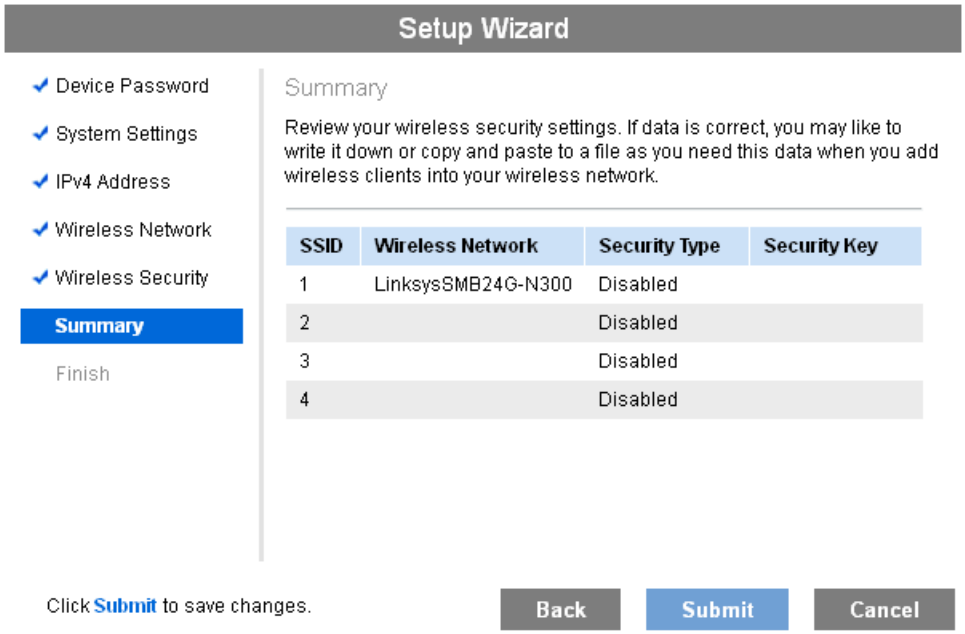


Figure 7: Setup Wizard - Summary

9. Click **Finish** to leave the wizard.

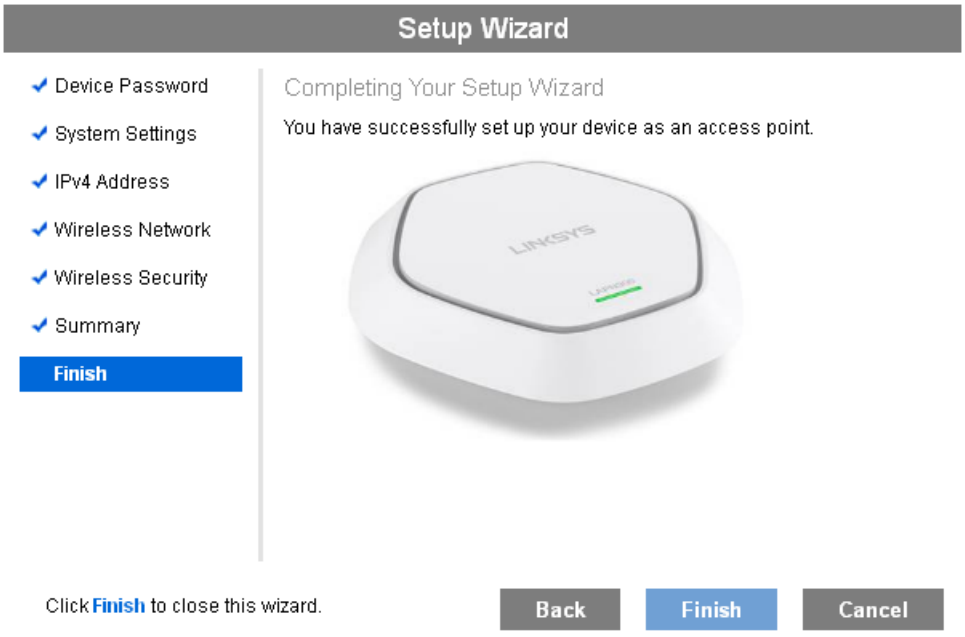


Figure 8: Setup Wizard - Finish

Administration

User accounts

Manage user accounts. The access point supports up to 5 users: one administrator and four normal users.

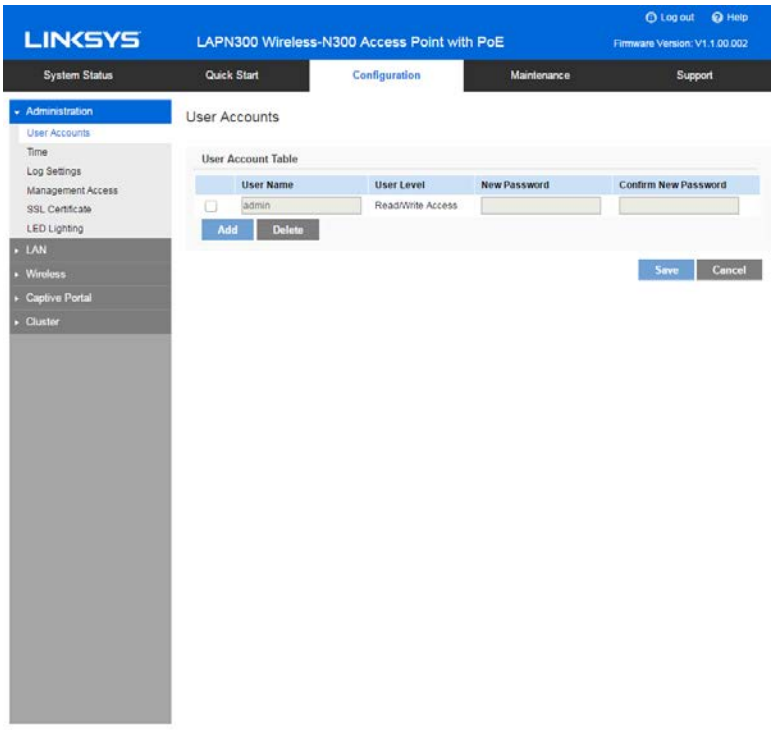


Figure 9: User Accounts

User Accounts Screen

User Account Table	
User Name	Enter the User Name to connect to the access point's admin interface. User Name is effective once you save settings. User Name can include up to 63 characters. Special characters are allowed.
User Level	Only administrator account has Read/Write permission to the access point's admin interface. All other accounts have Read Only permission.
New Password	Enter the Password to connect to the access point's admin interface. Password must be between 4 and 63 characters. Special characters are allowed.
Confirm New Password	Re-enter password.

Time

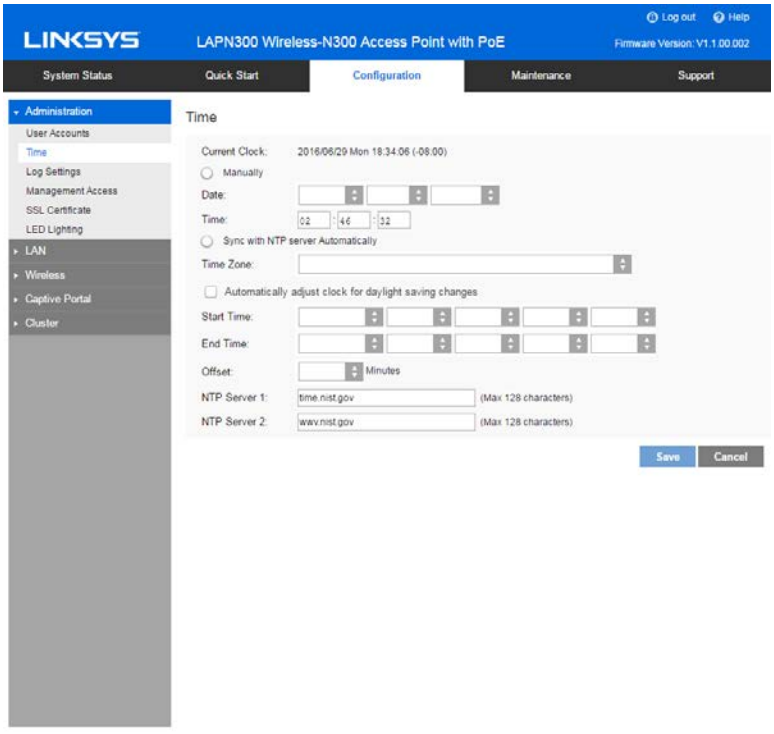


Figure 10: Time Screen

Time Screen

Time	
Current Time	Display current date and time of the system.
Manually	Set date and time manually.
Automatically	When enabled (default setting) the access point will get the current time from a public time server.
Time Zone	Choose the time zone for your location from the drop-down list. If your location observes daylight saving time, enable "Automatically adjust clock for daylight saving changes."
Start Time	Specify the start time of daylight saving.
End Time	Specify the end time of daylight saving.
Offset	Select the adjusted time of daylight saving.
NTP	
NTP Server 1	Enter the primary NTP server. It can be an IPv4 address or a domain name. Valid characters include alphanumeric characters, "_", "-" and ".". Maximum length is 64 characters.
NTP Server 2	Enter the secondary NTP server. It can be an IPv4 address or a domain name. Valid characters include alphanumeric characters, "_", "-" and ".". Maximum length is 64 characters.

Log settings

Record various types of activity on the access point. This data is useful for troubleshooting, but enabling all logs will generate a large amount of data and adversely affect performance.

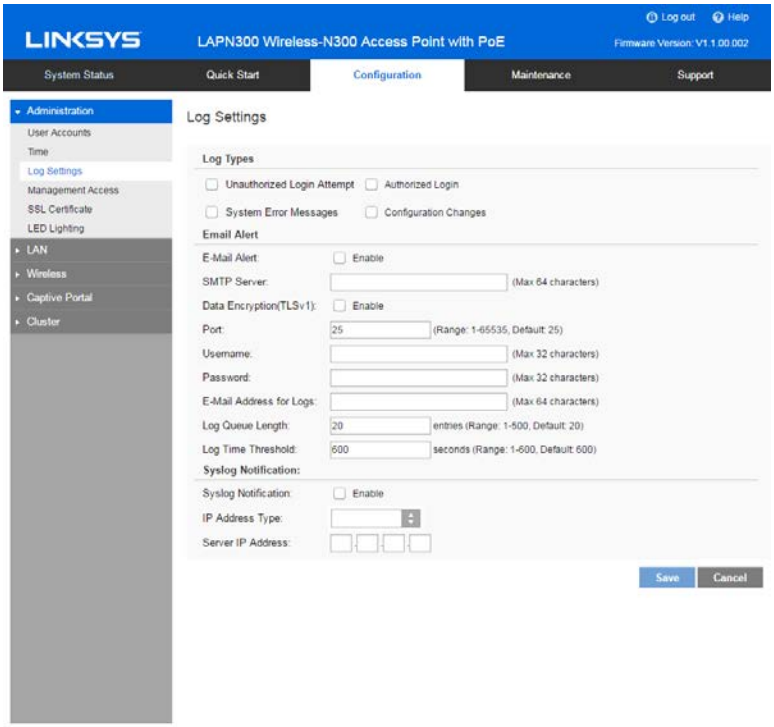


Figure 11: Log Settings Screen

Log Settings Screen

Log Types	
Log Types	Select events to log. Checking all options increases the size of the log, so enable only events you believe are required.
Email Alert	
Email Alert	Enable email alert function.
SMTP Server	Enter the email server that is used to send logs. It can be an IPv4 address or a domain name. Valid characters include alphanumeric characters, "_", "-" and ".". Maximum length is 64 characters.
Data Encryption	Enable if you want to use data encryption.
Port	Enter the port for the SMTP server. The port is a value from 1 to 65535 and default is 25.
Username	Enter the Username to log in to your SMTP server. The Username can include up to 32 characters. Special characters are allowed.
Password	Enter the Password to log in to your SMTP server. The Password can include up to 32 characters. Special characters are allowed.
Email Address for Logs	Enter the email address the log messages are to be sent to. Valid characters include alphanumeric characters, "_", "-", "." and "@". Maximum length is 64 characters.
Log Queue Length	Enter the length of the queue: up to 500 log messages. The default is 20 messages. When messages reach the set length the queue will be sent to the specified email address.
Log Time Threshold	Enter the time threshold (in seconds) used to check if the queue is full. It's a value from 1 to 600 and default is 600 seconds.
Syslog	
Syslog Notification	Enable Syslog notification.
IP Type	Select the IP type of the syslog server: IPv4 or IPv6.
Server IP Address	Enter the IPv4 or IPv6 address of syslog server here.

Management access

Configure the management methods of the access point.

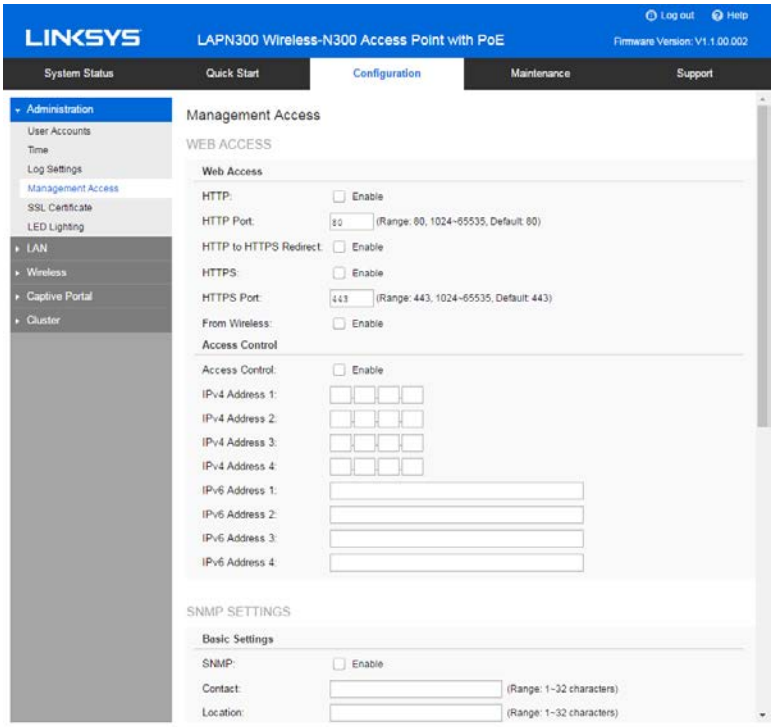


Figure 12: Management Access Screen

Management Access Screen

Web Access	
HTTP	HTTP (Hyper Text Transfer Protocol) is the standard for transferring files (text, graphic images and other multimedia files) on the World Wide Web. Enable to allow Web access by HTTP protocol.
HTTP Port	Specify the port for HTTP. It can be 80 (default) or from 1024 to 65535.
HTTP to HTTPS Redirect	Enable to redirect Web access of HTTP to HTTPS automatically. This field is available only when HTTP access is disabled.

HTTPS	HTTPS (Hypertext Transfer Protocol Secure) can provide more secure communication with the SSL/TLS protocol, which support data encryption to HTTP clients and servers. Enable to allow Web access by HTTPS protocol.
HTTPS Port	Specify the port for HTTPS. It can be 443 (default) or from 1024 to 65535.
From Wireless	Enable wireless devices to connect to access point's admin page. Disabled by default.
Access Control	By default, no IP addresses are prohibited from accessing the device's admin page. You can enable access control and enter specified IP addresses for access. Four IPv4 and four IPv6 addresses can be specified.
SNMP Settings	
SNMP	Simple Network Management Protocol (SNMP) is a network monitoring and management protocol. Enable or disable SNMP function here. Disabled by default.
Contact	Enter contact information for the access point. The contact includes 1 to 32 characters. Special characters are allowed.
Location	Enter the area or location where the access point resides. The location includes 1 to 32 characters. Special characters are allowed.
SNMPv1/v2 Settings	
Get Community	Enter the name of Get Community. Get Community is used to read data from the access point and not for writing data into the access point. Get Community includes 1 to 32 characters. Special characters are allowed.

Set Community	Enter the name of Set Community. Set Community is used to write data into the access point. The Set Community includes 1 to 32 characters. Special characters are allowed.
SNMPv3 Settings	
SNMPv3 Settings	Configure the SNMPv3 settings if you want to use SNMPv3. Username: Enter the username. It includes 0 to 32 characters. Special characters are allowed. Authentication Protocol: None or HMAC-MD5. Authentication Key: 8 to 32 characters. Special characters are allowed. Privacy Protocol: None or CBC-DES. Privacy Key: 8 to 32 characters. Special characters are allowed.
Access Control	
Access Control	When SNMP is enabled, any IP address can connect to the access point's admin page through SNMP. You can enable access control to allow specified IP addresses. Two IPv4 and two IPv6 addresses can be specified.
SNMP Trap	
Trap Community	Enter the Trap Community server. It includes 1 to 32 characters. Special characters are allowed.
Trap Destination	Two Trap Community servers are supported: can be IPv4 or IPv6.

SSL certificate

Manage SSL certificate used by HTTPS.

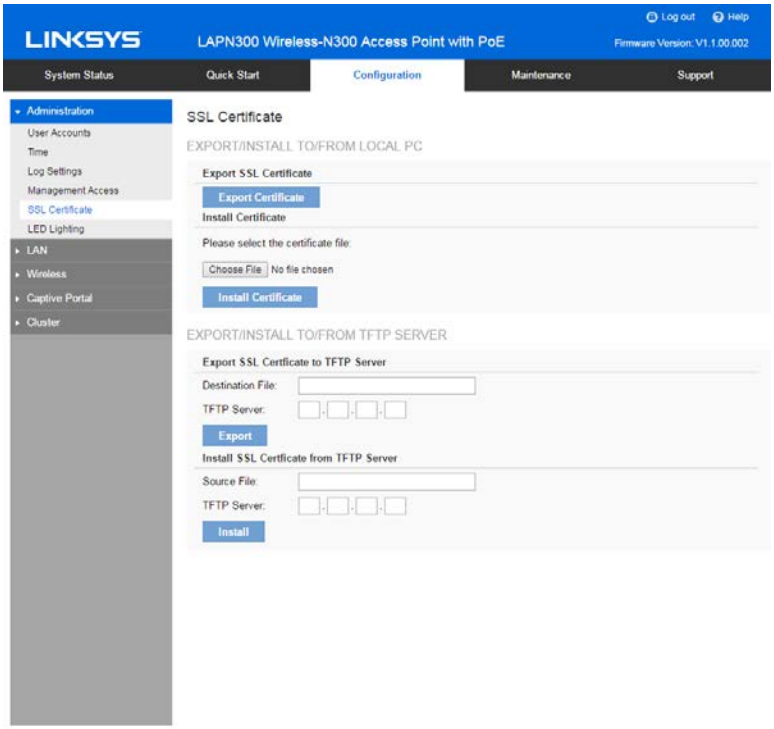


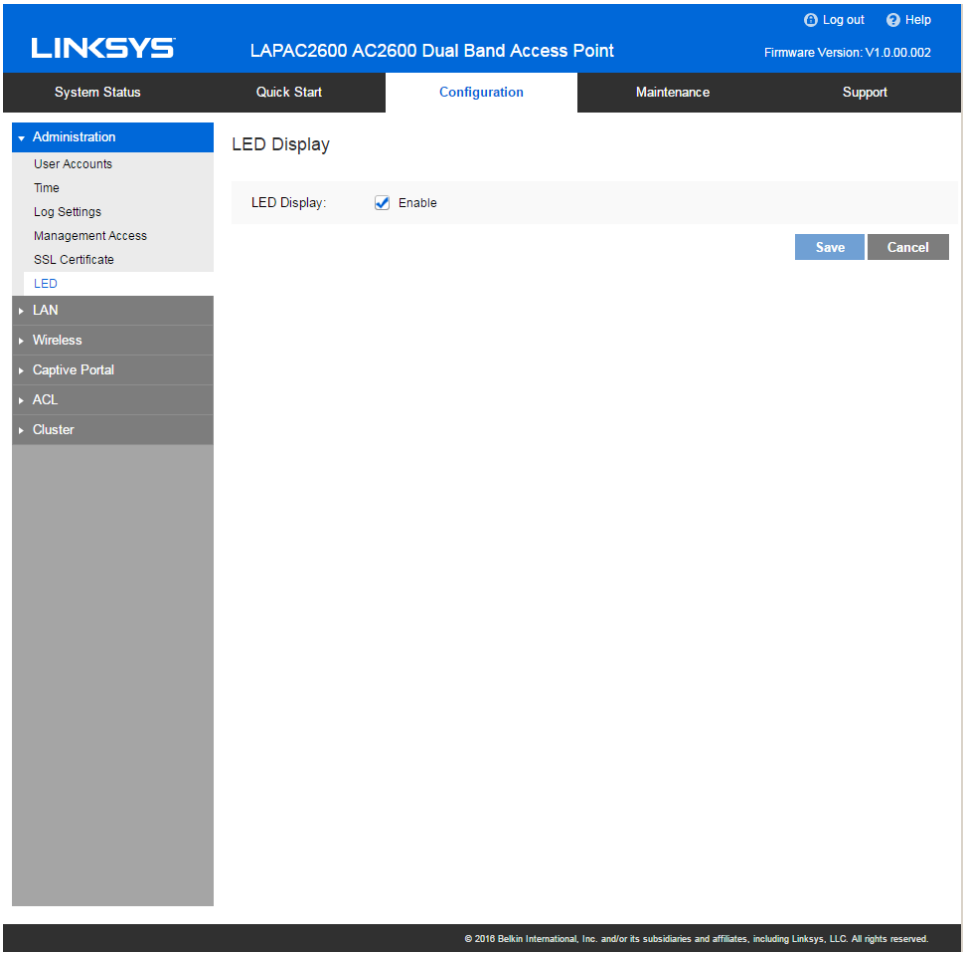
Figure 13: SSL Certificate Screen

SSL Certificate Screen

Export/Restore to/from Local PC	
Export SSL Certificate	Click to export the SSL certificate.
Install Certificate	Browse to choose the certificate file. Click Install Certificate button.
Export to TFTP Server	
Destination File	Enter the name of the destination file.
TFTP Server	Enter the IPv4 address for the TFTP server.
Export	Click to export the SSL certificate to the TFTP server.
Restore from TFTP Server	
Source File	Enter the name of the source file.
TFTP Server	Enter the IPv4 address for the TFTP server.
Install	Click to install the file to the device.

LED

Enable or disable the LED on the top cover of LAPN300.



LED	
LED Display	If disabled, the LED will be off even when the access point is working. By default, LED is enabled (on).

LAN

Network setup

Configure basic device settings, VLAN settings and settings for the LAN interface, including static or dynamic IPv4/IPv6 address assignment.

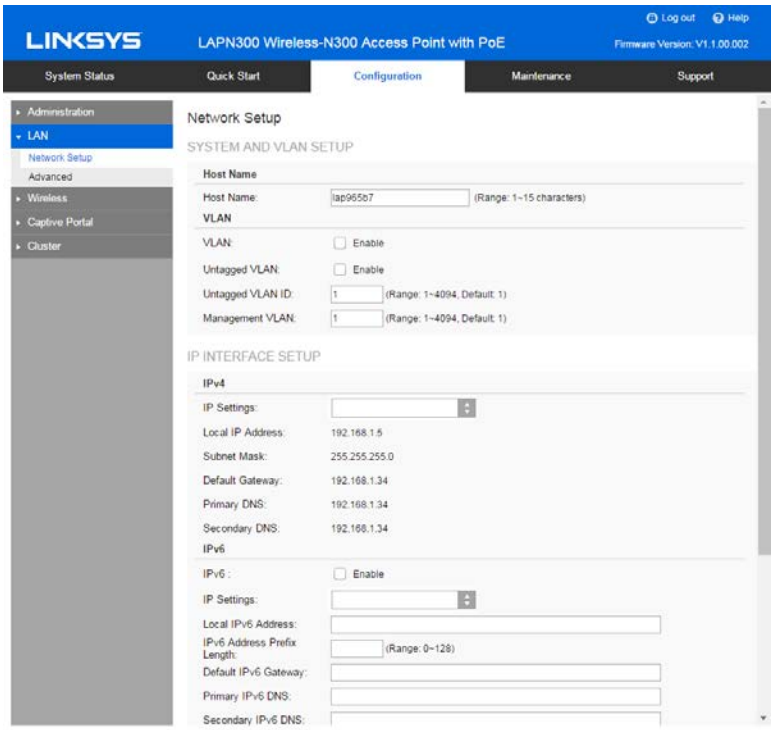


Figure 14: Network Setup Screen

Network Setup Screen

TCP/IP	
Host Name	Assign a host name to this access point. Host name consists of 1 to 15 characters. Valid characters include A-Z, a-z, 0-9 and -. Hyphen character cannot be first and last character of hostname and hostname cannot be composed of all digits.
VLAN	Enables or disables VLAN function. Workgroup Bridge can only be enabled when VLAN function is disabled.

Untagged VLAN	Enables or disables VLAN tagging. If enabled (default), traffic is untagged when VLAN ID is equal to Untagged VLAN ID and untagged traffic can be accepted by LAN port. If disabled, traffic from the LAN port is always tagged and only tagged traffic can be accepted from LAN port. By default all traffic on the access point uses VLAN 1, the default untagged VLAN.
Untagged VLAN ID	Specifies a number between 1 and 4094 for the untagged VLAN ID. The default is 1. Traffic on the VLAN that you specify in this field is not be tagged with a VLAN ID when forwarded to the network. Untagged VLAN ID field is active only when untagged VLAN is enabled. VLAN 1 is the default for untagged VLAN.
Management VLAN	The VLAN associated with the IP address you use to connect to the access point. Provide a number between 1 and 4094 for the Management VLAN ID. The default is 1.
IPv4/v6	
IP Settings	Select Automatic Configuration or Static IP Address.
IP Address	Enter an unused IP address from the address range used on your LAN.
Subnet Mask	Enter the subnet mask for the IP address above.
Default Gateway	Enter the gateway for the IP address above.
Primary DNS	Enter the DNS address.
Secondary DNS	Optional. If entered, this DNS will be used if the Primary DNS does not respond.

Advanced

Configure advanced network settings of the access point.

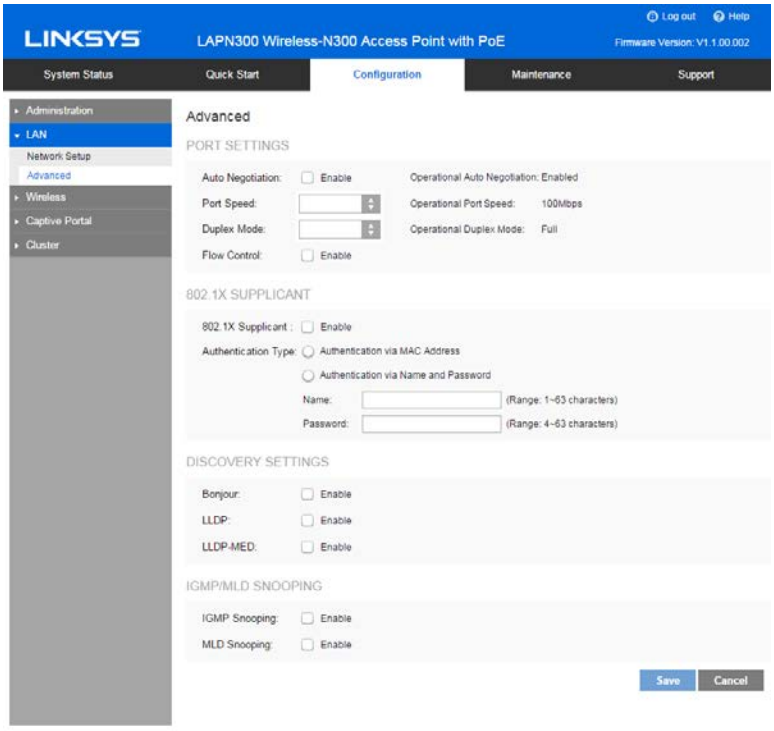


Figure 15: Advanced Screen

Advanced Screen

Port Settings	
Auto Negotiation	If enabled, Port Speed and Duplex Mode will become grey and cannot be configured. If disabled, Port Speed and Duplex Mode can be configured.
Operational Auto Negotiation	Current Auto Negotiation mode of the Ethernet port.
Port Speed	Select the speed of the Ethernet port. Available only when Auto Negotiation is disabled. The option can be 10M, 100M or 1000M (default).
Operational Port Speed	Displays the current port speed of the Ethernet port.
Duplex Mode	Select the duplex mode of the Ethernet port. Available only when Auto Negotiation is disabled. The option can be Half or Full (default).
Operational Duplex Mode	Displays the current duplex mode of the Ethernet port.
Flow Control	Enable or disable flow control of the Ethernet port.

802.1x Supplicant	
802.1x Supplicant	Enable if your network requires this access point to use 802.1X authentication in order to operate.
Authentication	This feature supports following two kinds of authentication: • Authentication via MAC Address Select this if you want to use MAC address for authentication. The access point uses lowercase MAC address for Name and Password, like xxxxxxxxxxxx. • Authentication via Name and Password Select this if you want to use name and password for authentication. Name - Enter the login name. The name includes 1 to 63 characters. Special characters are allowed. Password - Enter the desired login password. The password includes 4 to 63 characters. Special characters are allowed.
Discovery Settings	
Bonjour	Enable if administrator wants the access point to be discovered by Bonjour enabled devices automatically. If VLAN is enabled, the discovery packets will be sent out via management VLAN only. The access point supports http and https services.
LLDP	Enable if administrator wants the access point to be discovered by switch by LLDP protocol. Information such as product name, device name, firmware version, IP address, MAC address and so on will be advertised.
LLDP-MED	Enable if administrator wants the access point to be discovered by switch by LLDP-MED protocol. Information such as product name, device name, firmware version, IP address, MAC address and so on will be advertised.

IGMP/MLD Snooping	
IGMP Snooping	IGMP (Internet Group Management Protocol) is a communications protocol used by hosts and adjacent routers on IP networks to establish multicast group memberships. IGMP is an integral part of IP multicast. IGMP snooping streamlines multicast traffic handling by examining (snooping) IGMP membership report messages from interested hosts, multicast traffic is limited to the subset of ports on which the hosts reside. IGMP snooping is enabled by default in the access point The access point supports IGMPv1, IGMPv2 and IGMPv3 in IGMP Snooping.
MLD Snooping	MLD (Multicast Listener Discovery) is a component of the Internet Protocol Version 6 (IPv6) suite. MLD is used by IPv6 routers for discovering multicast listeners on a directly attached link, much like IGMP is used in IPv4. Multicast Listener Discovery (MLD) Snooping provides multicast containment by forwarding traffic only to those clients that have MLD receivers for a specific multicast group (destination address). The access point maintains the MLD group membership information by processing MLD reports and generating messages so traffic can be forwarded to ports receiving MLD reports. MLD snooping is enabled by default in the access point The access point supports MLDv1 and MLDv2 in MLD Snooping.

Wireless

Basic Settings

Basic Settings provides the essential configuration for your wireless radio and SSID. You should be able to set up your wireless network with these essential parameters configured. Advanced wireless settings, such as Band Steering, Channel Bandwidth, etc., will be on *Configuration* > *Wireless* > *Advanced Settings* screen.

Click *Basic Settings* on the *Wireless* menu.

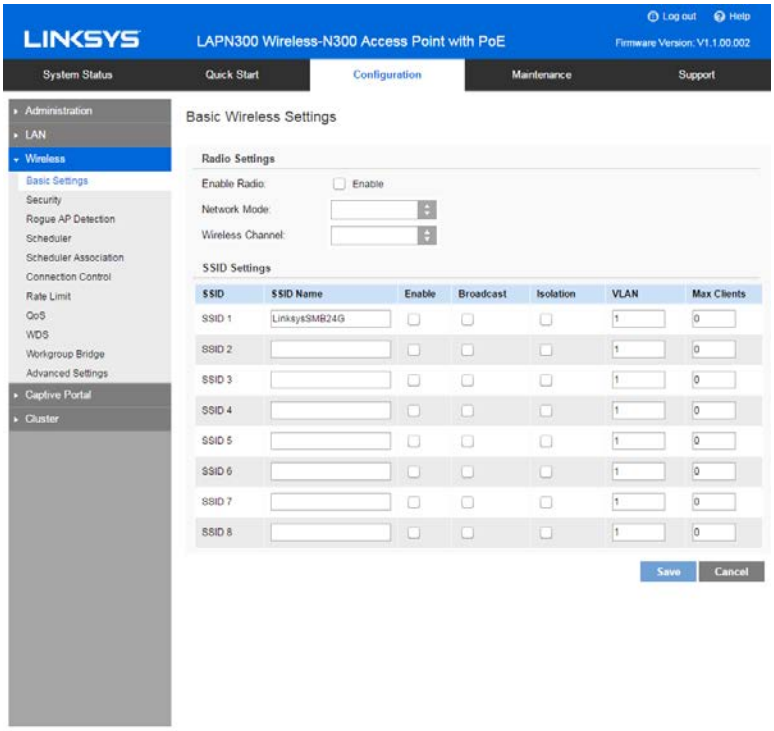


Figure16: Basic Settings Screen

Basic Wireless Settings Screen

Radio Settings	
Enable Radio	Enable or disable the wireless radio.
Wireless Mode	• G only - allow connection by 802.11G wireless stations only. • N only - allow connection by 802.11N wireless stations only. • B/G-Mixed - allow connection by 802.11B and G wireless stations only. • B/G/N-Mixed (Default) - allow connections by 802.11N, 802.11B and 802.11G wireless stations.

Wireless Channel	Select wireless channel of the radio. If Auto is selected, the access point will select the best available channel when device boots up. If you experience lost connections and/or slow data transfers experiment with manually setting different channels to see which is the best.
SSID Settings	
SSID Name	Enter the desired SSID Name. Each SSID must have a unique name. The name includes 1 to 32 characters
Broadcast	Enable or disable the broadcast of the SSID. When the access point does not broadcast its SSID, the network name is not shown in the list of available networks on a client station. Instead, you must enter the exact network name manually into the wireless connection utility on the client so that it can connect.
Isolation	Enable or disable isolation among clients of the SSID. If enabled, wireless clients cannot communicate with others in the same SSID. Disabled by default.
VLAN ID	Enter the VLAN ID of the SSID. Used to tag packets which are received from the wireless clients of the SSID and sent from Ethernet or WDS interfaces. Applicable only when VLAN function is enabled. VLAN function can be configured in Configuration → LAN → Network Setup screen.
Max Clients	Enter the number of clients that can connect to the SSID. The range is from 0 to 32, and 0 means no limit.

Security

Configure security settings of SSIDs to provide data protection over the wireless network.

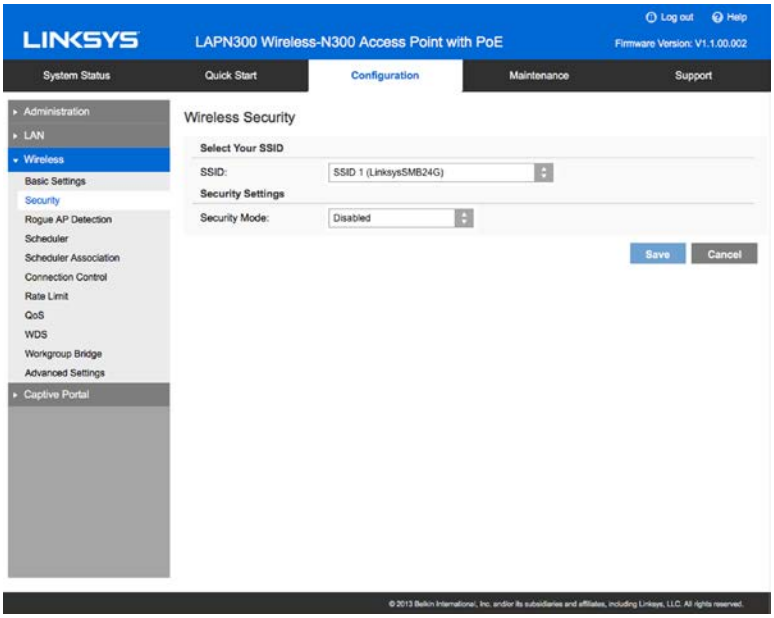


Figure 17: Security Settings

SSID Settings Screen

Security	
Select SSID	Select the desired SSID from the drop-down list.
Security Mode	Select the desired security method from the list.

Security Mode

- **Disabled** - No security. Anyone using the correct SSID can connect to your network.
- **WEP** - The 802.11b standard. Data is encrypted before transmission, but the encryption system is not very strong.
- **WPA2-Personal** - This is a further development of WPA-PSK, and offers even greater security, using the AES (Advanced Encryption Standard) method.
- **WPA/WPA2-Personal -** This method, sometimes called Mixed Mode, allows clients to use either WPA-Personal (with TKIP) or WPA2-Personal (with AES).

- **WPA2-Enterprise** - Requires a RADIUS Server on your LAN to provide the client authentication according to the 802.1x standard. Data transmissions are encrypted using the WPA2 standard.

  If this option is selected:

  - This access point must have a client login on the RADIUS Server.
  - Each user must authenticate on the RADIUS Server. This is usually done using digital certificates.
  - Each user's wireless client must support 802.1x and provide the RADIUS authentication data when required.
  - All data transmission is encrypted using the WPA2 standard. Keys are automatically generated, so no key input is required.
- WPA/WPA2-Enterprise – This method, sometimes called Mixed Mode, allows clients to use either WPA-Enterprise (with TKIP) or WPA2-Enterrpise (with AES).
- **RADIUS** - RADIUS mode utilizes RADIUS server for authentication and dynamic WEP key generation for data encryption.

Security Settings – WEP

This is the 802.11b standard. Data is encrypted before transmission, but the encryption system is not very strong.

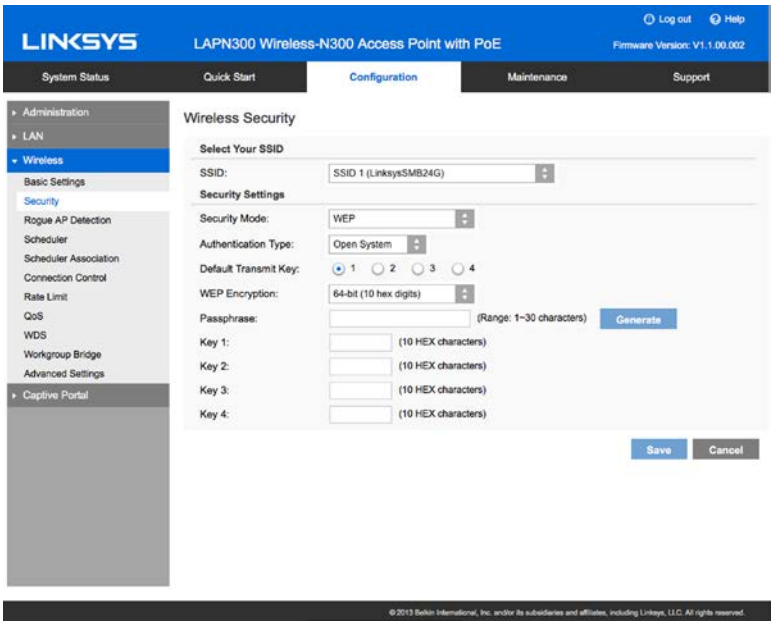


Figure 18: WEP Wireless Security Screen

WEP Screen

WEP	
Authentication Type	Select Open System or Shared Key. All wireless stations must use the same method.
Default Transmit Key	Select a transmit key.
WEP Encryption	Select an encryption option, and ensure your wireless stations have the same setting: • 64-Bit Encryption - Keys are 10 Hex characters. • 128-Bit Encryption - Keys are 26 Hex characters.
Passphrase	Generate a key or keys instead of entering them directly. Enter a word or group of printable characters in the Passphrase box and click the Generate button to automatically configure the WEP key. It consists of 1 to 30 characters.
Key Value	Enter a key in hexadecimal format. **Note**—*Due to hardware limitation, one set of WEP key is supported.*

Security Settings - WPA2-Personal

This is a further development of WPA-Personal, and offers even greater security.

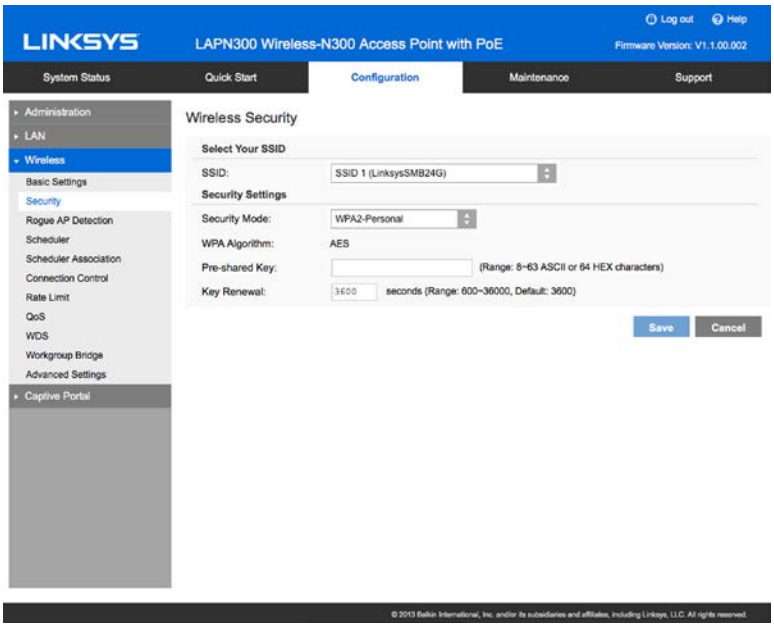


Figure19: WPA2-Personal Wireless Security Screen

WPA2-Personal Screen

WPA2-Personal	
WPA Algorithm	The encryption method is AES. Wireless stations must also use AES.
Pre-shared Key	Enter the key value. It is 8 to 63 ASCII characters or 64 HEX characters. Other wireless stations must use the same key.
Key Renewal	Specify the value of Group Key Renewal. It's a value from 600 to 36000 and default is 3600 seconds. WPA automatically changes secret keys after a certain period of time. The group key interval is the period of time in between automatic changes of the group key, which all devices on the network share. Constantly keying the group key protects your network against intrusion, as the would-be intruder must cope with an ever-changing secret key.

Security Settings - WPA/WPA2-Personal

This method, sometimes called Mixed Mode, allows clients to use either WPA-Personal or WPA2-Personal.

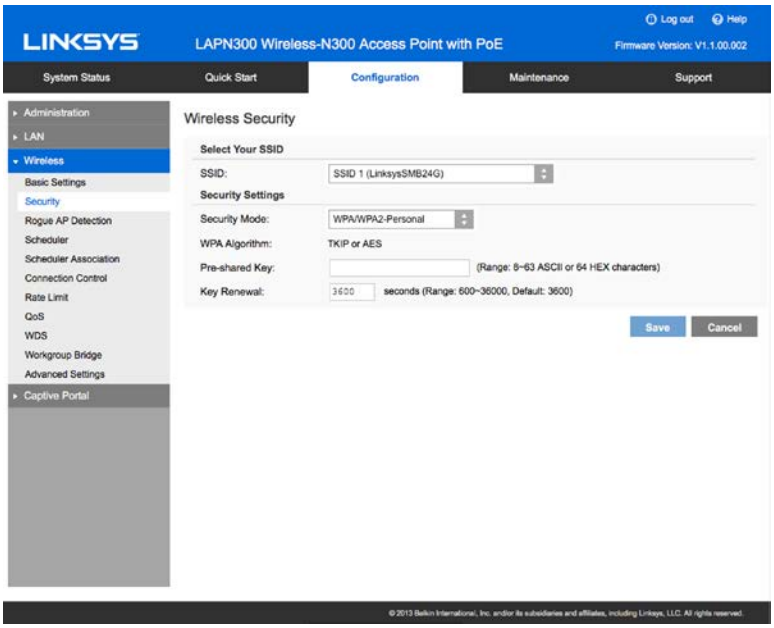


Figure 20: WPA/WPA2-Personal Wireless Security Screen

WPA/WPA2-Personal Screen

WPA/WPA2-Personal	
WPA Algorithm	The encryption method is TKIP or AES.
Pre-shared Key	Enter the key value. It is 8 to 63 ASCII characters or 64 HEX characters. Other wireless stations must use the same key.
Key Renewal	Specify the value of Group Key Renewal. It's a value from 600 to 36000, and default is 3600 seconds. WPA automatically changes secret keys after a certain period of time. The group key interval is the period of time in between automatic changes of the group key, which all devices on the network share. Constantly keying the group key protects your network against intrusion, as the would-be intruder must cope with an ever-changing secret key.

Security Settings - WPA2-Enterprise

This version of WPA2-Enterprise requires a RADIUS Server on your LAN to provide the client authentication. Data transmissions are encrypted using the WPA2 standard.

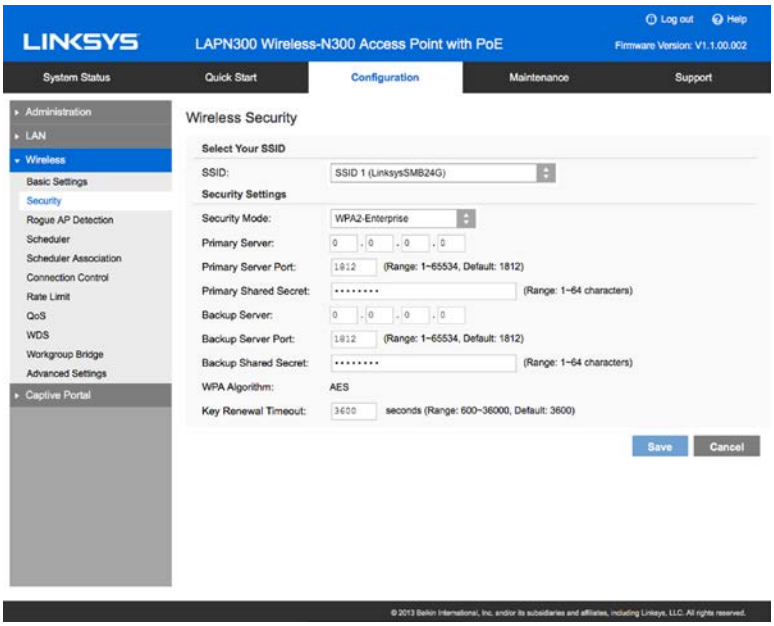


Figure 21: WPA2-Enterprise Wireless Security Screen

WPA2-Enterprise Screen

WPA2-Enterprise	
Primary Server	Enter the IP address of the RADIUS Server on your network.
Primary Server Port	Enter the port number used for connections to the RADIUS Server. It is a value from 1 to 65534, and default is 1812.
Primary Shared Secret	Enter the key value to match the RADIUS Server. It consists of 1 to 64 characters.
Backup Server	The Backup Authentication Server will be used when the Primary Authentication Server is not available.
Backup Server Port	Enter the port number used for connections to the Backup RADIUS Server. It's a value from 1 to 65534, and default is 1812.
Backup Shared Secret	Enter the key value to match the Backup RADIUS Server. It consists of 1 to 64 characters.
WPA Algorithm	The encryption method is AES.
Key Renewal Timeout	Specify the value of Group Key Renewal. It is a value from 600 to 36000 sec, and default is 3600 sec. WPA automatically changes secret keys after a certain period of time. The group key interval is the period of time in between automatic changes of the group key, which all devices on the network share. Constantly keying the group key protects your network against intrusion, as the would-be intruder must cope with an ever-changing secret key.

Security Settings - WPA/WPA2-Enterprise

This version of WPA2-Enterprise requires a RADIUS Server on your LAN to provide the client authentication. Data transmissions are encrypted using either the WPA or WPA2 standard.

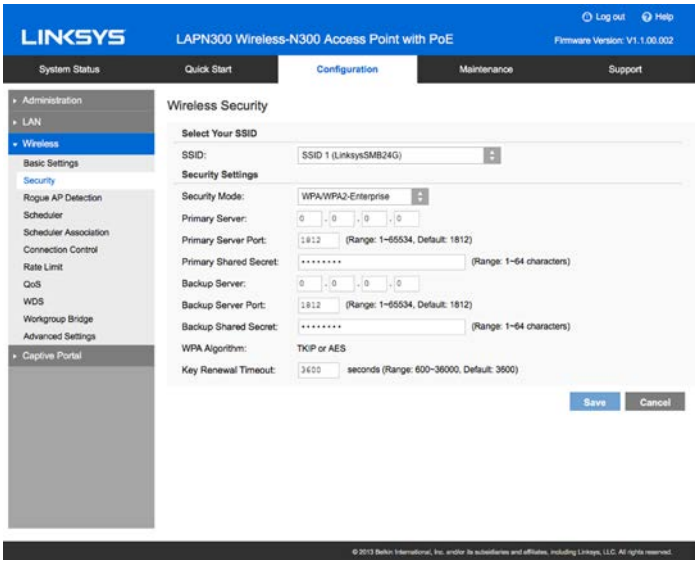


Figure 22: WPA/WPA2-Enterprise Wireless Security Screen

WPA/WPA2-Enterprise Screen

WPA/WPA2-Enterprise	
Primary Server	Enter the IP address of the RADIUS Server on your network.
Primary Server Port	Enter the port number used for connections to the RADIUS Server. It is a value from 1 to 65534, and default is 1812.
Primary Shared Secret	Enter the key value to match the RADIUS Server. It consists of 1 to 64 characters.
Backup Server	The Backup Authentication Server will be used when the Primary Authentication Server is not available.
Backup Server Port	Enter the port number used for connections to the Backup RADIUS Server. It is a value from 1 to 65534, and default is 1812.
Backup Shared Secret	Enter the key value to match the Backup RADIUS Server. It consists of 1 to 64 characters.
WPA Algorithm	The encryption method is TKIP or AES.
Key Renewal Timeout	Specify the value of Group Key Renewal. It is a value from 600 to 36000 sec, and default is 3600 sec. WPA automatically changes secret keys after a certain period of time. The group key interval is the period of time between automatic changes of the group key, which all devices on the network share. Constantly keying the group key protects your network against intrusion, as the would-be intruder must cope with an ever-changing secret key.

RADIUS

Use RADIUS server for authentication and dynamic WEP key generation for data encryption.

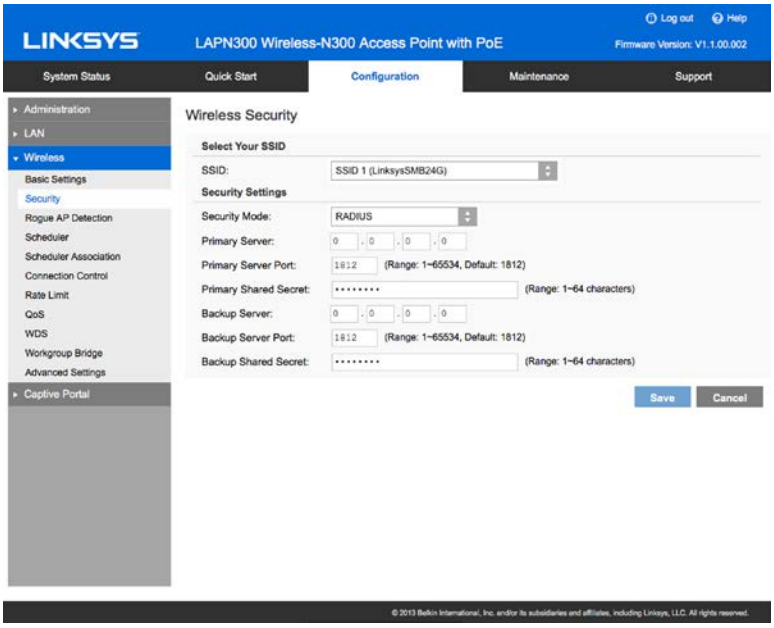


Figure 23: RADIUS Settings

RADIUS Screen

Authentication Server	
Primary Server	Enter the IP address of the RADIUS Server on your network.
Primary Server Port	Enter the port number used for connections to the RADIUS Server. It is a value from 1 to 65534, and default is 1812.
Primary Shared Secret	Enter the key value to match the RADIUS Server. It consists of 1 to 64 characters.
Backup Server	The Backup Authentication Server will be used when the Primary Authentication Server is not available.
Backup Server Port	Enter the port number used for connections to the Backup RADIUS Server. It is a value from 1 to 65534, and default is 1812.
Backup Shared Secret	Enter the key value to match the Backup RADIUS Server. It consists of 1 to 64 characters.

Rogue AP Detection

Detect an unexpected or unauthorized access point installed in a secure network environment.

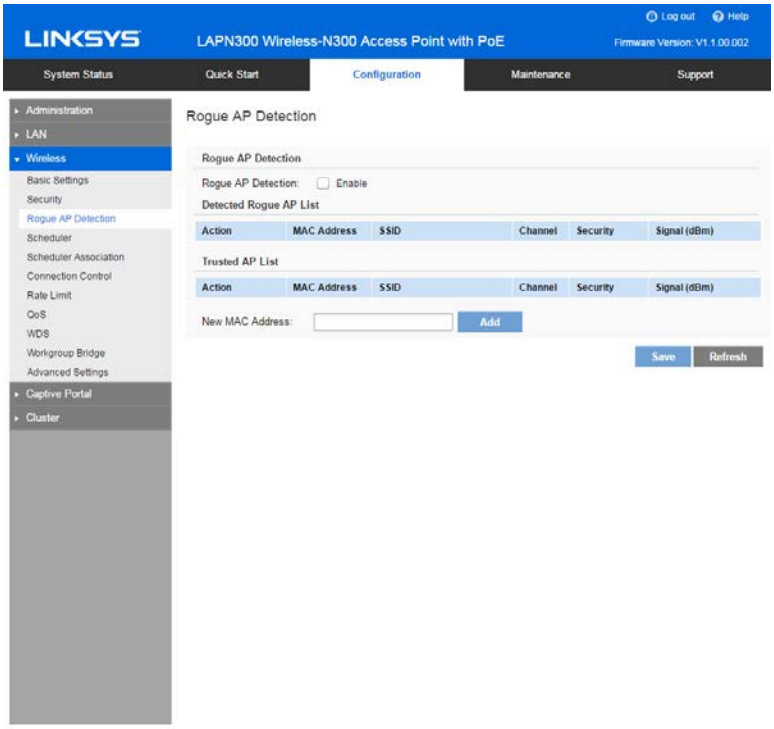


Figure 24: Rogue AP Screen

Rogue AP Screen

Rogue AP	Enable or disable Rogue AP Detection.
Detected Rogue AP List	
Action	Click *Trust* to move the AP to the Trusted AP List.
MAC Address	The MAC address of the Rogue AP.
SSID	The SSID of the Rogue AP.
Channel	The channel of the Rogue AP.
Security	The security method of the Rogue AP.
Signal	The signal level of the Rogue AP.

Trusted AP List	
Action	Click *Untrust* to move the AP to the Rogue AP List.
MAC Address	The MAC address of the Trusted AP.
SSID	The SSID of the Trusted AP.
Channel	The channel of the Trusted AP.
Security	The security method of the Trusted AP.
Signal	The signal level of the Trusted AP.
New MAC Address	Add one trusted AP by MAC address.

Scheduler

Configure a rule with a specific time interval for SSIDs to be operational. Automate enabling or disabling SSIDs based on the profile definition. Support up to 16 profiles and each profile can include four time rules.

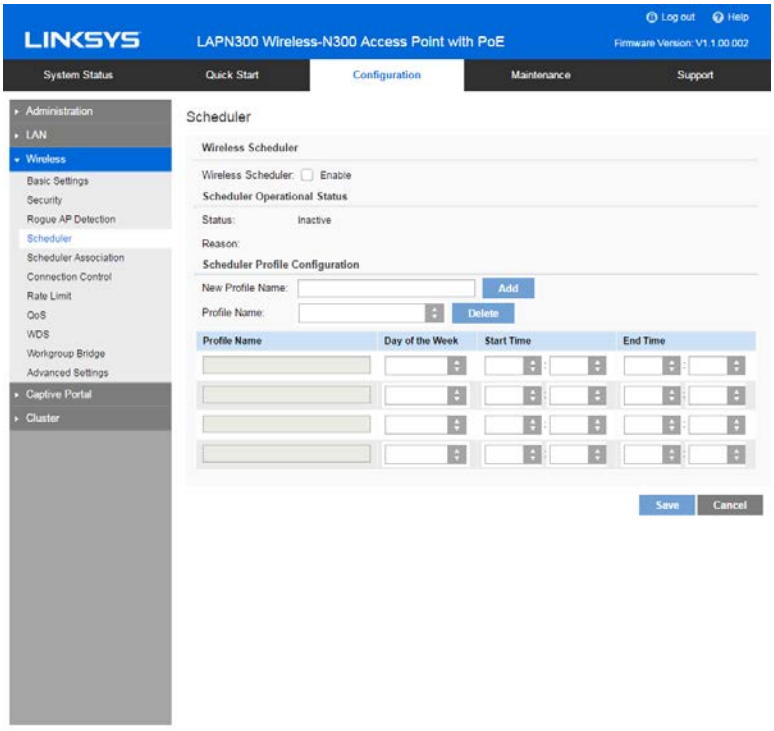


Figure 25: Scheduler Screen

Scheduler Screen

Wireless Scheduler	Enable or disable wireless scheduler on the radio. It is disabled by default. If disabled, even if some SSIDs are associated with profiles, they will be always active.
Scheduler Operational Status	
Status	The operational status of the scheduler.
Reason	The detailed reason for the scheduler operational status. It includes the following situations. • System time is outdated. Scheduler is inactive because system time is outdated. • Administrative Mode is disabled. Scheduler is disabled by administrator. • Active Scheduler is active.
Scheduler Profile configuration	
New Profile Name	Enter the name for new profile.
Profile Name	Select the desired profile from the list to configure.
Day of the Week	Select the desired day from the list. Option None means this time rule is disabled.
Start Time	Choose the start time.
Finish Time	Choose the finish time.

Scheduler Association

Associate defined scheduler profiles with SSIDs.

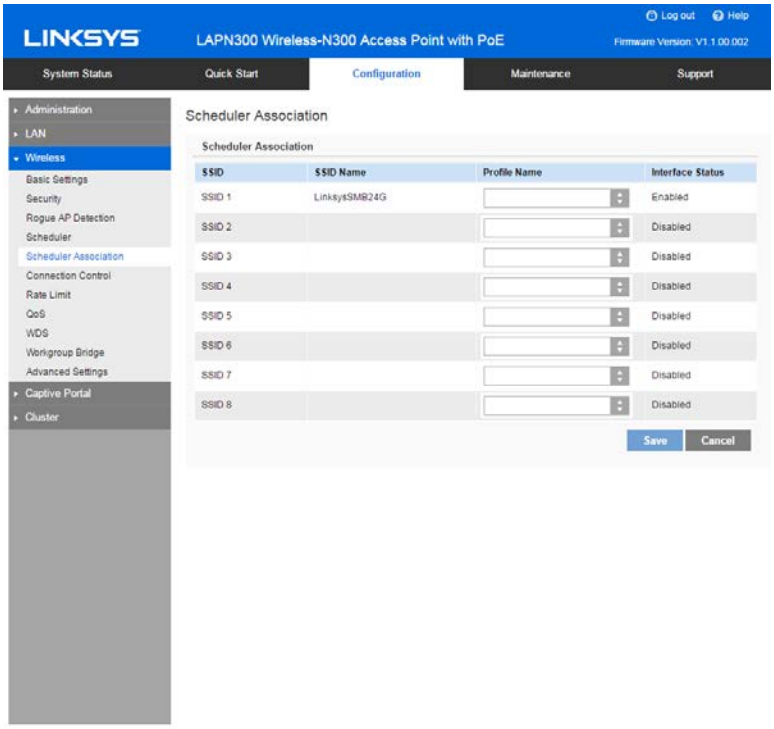


Figure 26: Scheduler Association Screen

Scheduler Association Screen

Scheduler Association	
SSID	The index of SSID.
SSID Name	The name of the SSID.
Profile Name	Choose the profile that is associated with the SSID. If the profile associated with the SSID is deleted, then the association will be removed. If "None" is selected, it means no scheduler profile is associated.
Interface Status	The Status of the SSID. It can be Enabled or Disabled. Scheduler only works when the SSID is enabled.

Connection Control

Exclude or allow only listed client stations to authenticate with the access point.

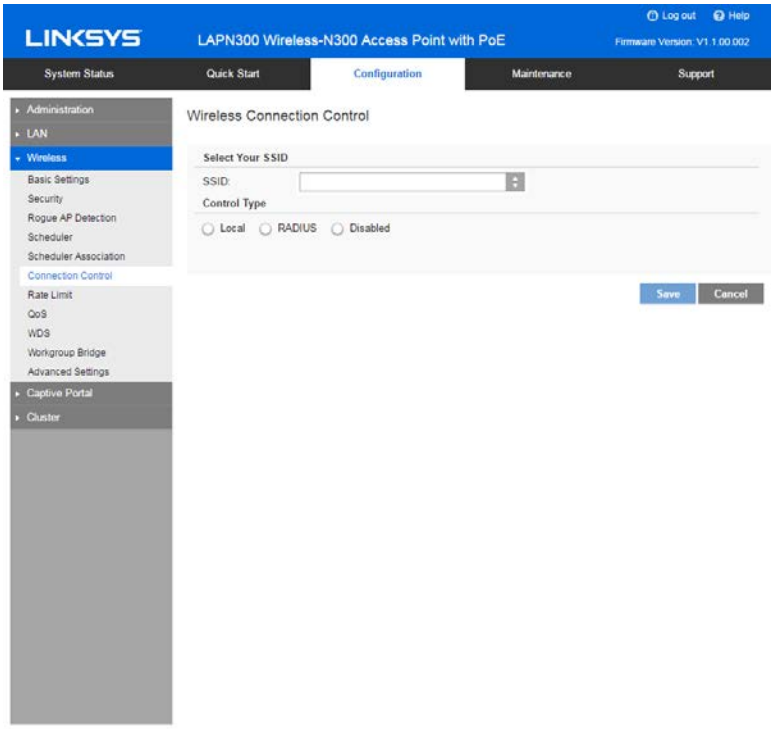


Figure 27: Connection Control Screen

Connection Control Screen

SSID	Select the desired SSID from the list.
Connection Control Type	Select the option from the drop-down list as desired. **Local**: Choose either *Allow only following MAC addresses to connect to wireless network* or *Prevent following MAC addresses from connection to wireless network*. You can enter up to 20 MAC addresses of wireless stations or choose the MAC address. **RADIUS:** Enter IP address, port number and shared secret for primary and backup RADIUS servers. **Disabled**: Control is turned off.

Rate Limit

Limit downstream and upstream rate of SSIDs.

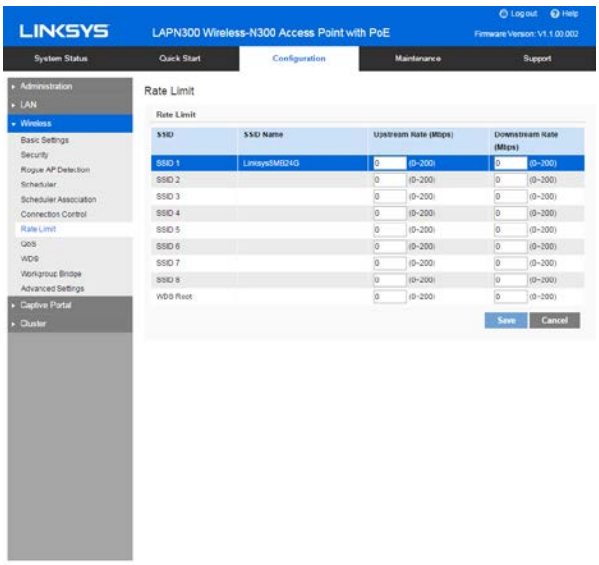


Figure 28: Rate Limit Screen

Rate Limit Screen

Rate Limit	
SSID	The index of SSID.
SSID Name	The name of the SSID.
Upstream Rate	Enter a maximum upstream for the SSID. The range is from 0 to 200 Mbps; 0 means no limitation. Upstream is for traffic from wireless client to access point.
Downstream Rate	Enter a maximum downstream for the SSID. The range is from 0 to 200 Mbps; 0 means no limitation. Downstream is for traffic from access point to wireless client.

Quality of Service (QoS)

Specify priorities for different traffic coming from your wireless client. Lower priority traffic will be slowed down to allow greater throughput or less delay for high priority traffic.

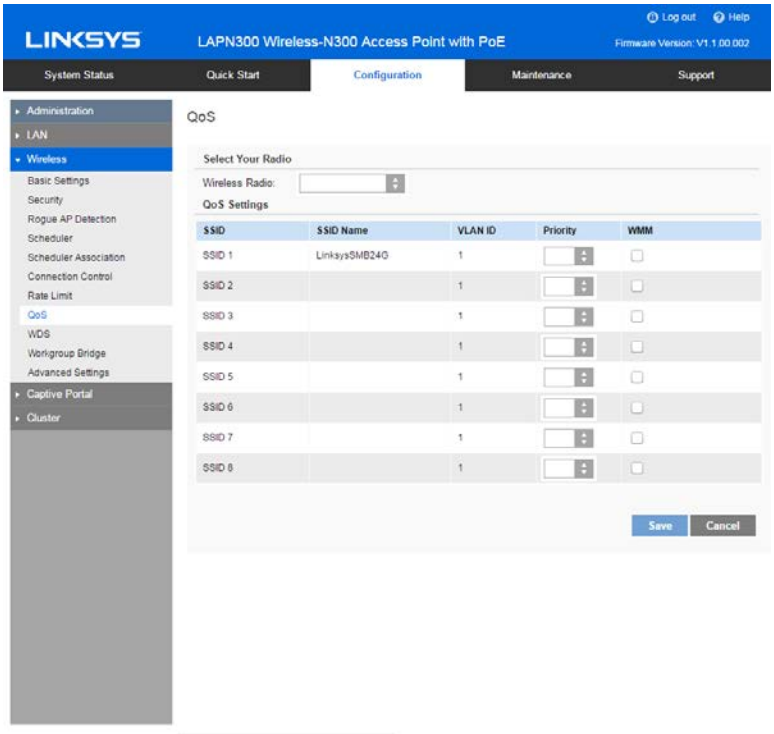


Figure 29: QoS Screen

QoS Screen

QoS Settings	
SSID	The index of SSID.
SSID Name	The name of the SSID.
VLAN ID	The VLAN ID of the SSID.
Priority	Select the priority level from the list. VLAN must be enabled in order to set priority. The 802.1p will be included in the VLAN header of the packets which are received from the SSID and sent from Ethernet or WDS interface.

WMM	Enable or disable WMM. WMM (Wi-Fi Multimedia) is a component of the IEEE 802.11e wireless LAN standard for QoS. WMM provides prioritization of wireless data packets from different applications based on four access categories: voice, video, best effort, and background. For an application to receive the benefits of WMM QoS, both it and the client running that application have to have WMM enabled. Legacy applications that do not support WMM and applications that do not require QoS, are assigned to the best effort category, which receives a lower priority than voice and video. WMM is enabled by default.

WDS

With Wireless Distribution System (WDS) you can expand a wireless network through multiple access points instead of linking them with a wired backbone.

WDS only works and interacts with LAPN300, LAPN600, LAPAC1200 or LAPAC1750 devices.

The access point can act as WDS Root or WDS Station:

- WDS Root - Receives WDS connections from remote WDS stations.
- WDS Station - Connects to remote WDS Root. Supports up to four WDS.

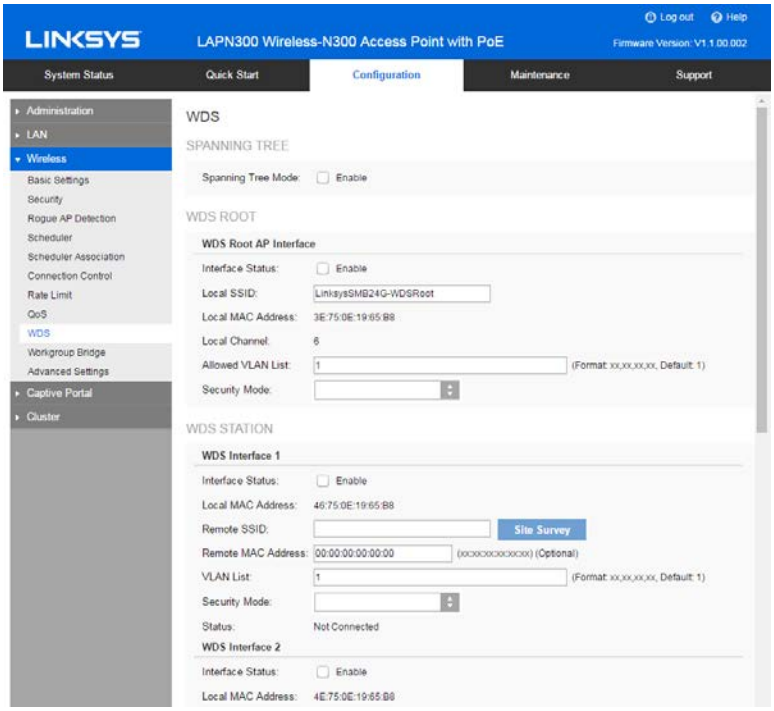


Figure 30: WDS

WDS screen

Spanning Tree (Recommended if you configure WDS connections)	
Spanning Tree	When enabled, STP helps prevent switching loops.
WDS Root	
Interface Status	Enable or Disable the WDS Root. Be sure the following settings on WDS Root device are determined and configured. The WDS Station must use the same settings as Root afterwards. • IEEE 802.11 Mode • Channel Bandwidth • Channel (Auto is not recommended) **Note—***To change IEEE 802.11 Mode and Channel settings, go to Wireless→ Basic Settings.* *To change Channel Bandwidth setting, go to Wireless → Advanced Settings.* **Note—***It is highly recommended that static channel is configured on both APs. Do not use Auto channel option when you enable WDS, as both APs in a WDS link must be on the same radio channel. If Auto option is configured, there is chance two access points run on different channels and WDS link cannot establish.* Workgroup Bridge and WDS will not work at the same time. When Workgroup Bridge is enabled, WDS will be disabled automatically.
Local SSID	Enter name of the WDS Root SSID (used when connected by WDS Stations).
Local MAC Address	MAC address of the WDS Root SSID.
Local Channel	The channel used by WDS Root SSID. WDS stations must use same channel as the WDS Root. Channel can be changed in "Basic Settings" page.

Allowed VLAN List	Enter the list of VLANs accepted by the WDS Root. When VLAN is enabled, WDS Root receives from WDS Stations only packets in the VLAN list. Packets not in the list will be dropped. The VLAN list is only applicable when VLAN is enabled. The VLAN list includes 1 to 16 VLAN IDs separated by "," such as "100,200,300,400,500,600,700,800".
Security Settings	Setting can be Disabled, WPA-Personal, WPA2-Personal, WPA2-Enterprise or WPA/WPA2-Enterprise.
WDS Station	
Interface Status	Enable or disable the WDS Station. Before configuring a WDS Station, be sure the following settings of the device are identical to the WDS Root that will be connected. • IEEE 802.11 Mode • Channel Bandwidth • Channel (Auto is not recommended) **Note—***To change IEEE 802.11 Mode and Channel settings, go to Wireless→ Basic Settings.* *To change Channel Bandwidth setting, go to Wireless → Advanced Settings.* **Note—***It is highly recommended that static channel is configured on both APs. Do not use Auto channel option when you enable WDS, as both APs in a WDS link must be on the same radio channel. If Auto option is configured, there is chance two access points run on different channels and WDS link cannot establish.* Workgroup Bridge and WDS will not work at the same time. When Workgroup Bridge is enabled, WDS will be disabled automatically.
Remote SSID	Enter the name of the Root's SSID. Click Site Survey button and choose from the list. You must do this for WDS Station to connect to a remote WDS Root.

Remote MAC Address	MAC address of the access point on the other end of the WDS link. Optional WDS Station connects to remote WDS Root by matching SSIDs, When there is more than one remote WDS Root with the same SSID, the WDS Station can differentiate them by MAC address. The format is xx:xx:xx:xx:xx:xx.
VLAN List	Enter the list of VLANs that are accepted by the WDS Station. When VLAN is enabled, the WDS Station forwards to the remote WDS Root only packets in the VLAN list. Packets not in the VLAN list cannot be forwarded to the remote WDS Root. The VLAN List is only applicable when VLAN is enabled. The VLAN list includes 1 to 8 VLAN IDs separated by "," such as "100,200,300,400,500,600,700,800".
Security Mode	The type of encryption to use on the WDS link. It must be same as the access point on the other end of the WDS link. The options are Disabled, WPA Personal, WPA2 Personal, WPA Enterprise or WPA2 Enterprise.
Status	Status of the WDS interface. It can be Disabled, Connected or Not Connected.

Workgroup Bridge

Extend the accessibility of a remote network. In Workgroup Bridge mode, the access point acts as a wireless station on the wireless LAN. It can bridge traffic between a remote wired network and a wireless LAN.

When Workgroup Bridge is enabled, SSID configuration still works to provide wireless services to clients.

All access points participating in Workgroup Bridge must have the identical settings for Radio interface, IEEE 802.11 mode, Channel Bandwidth, Channel (Auto is not recommended).

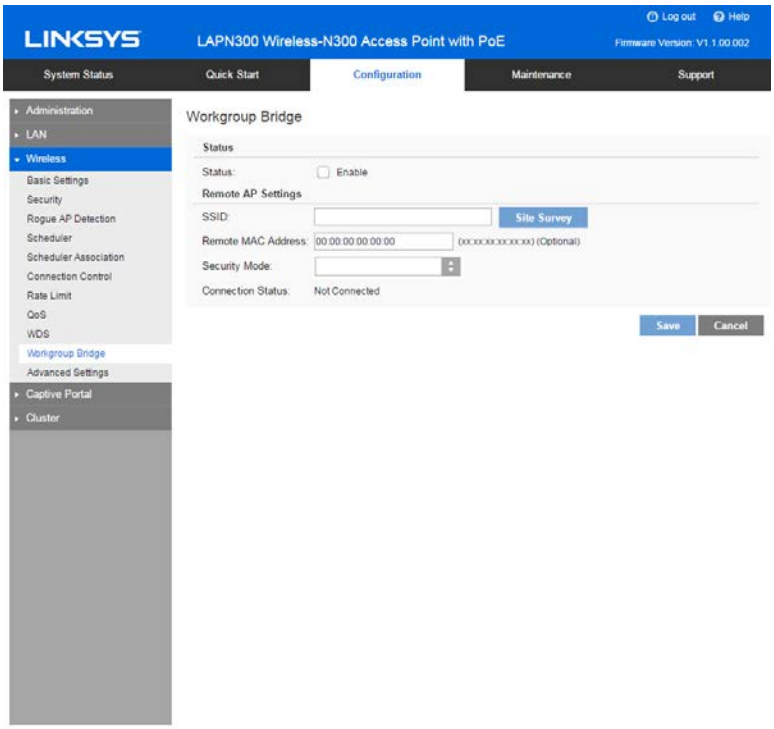


Figure 3113: Workgroup Bridge

Workgroup Bridge Screen

Status	
Status	Enable or disable Workgroup Bridge function. Workgroup Bridge can only be enabled when VLAN function is disabled. Before configuring Workgroup Bridge, make sure all devices in Workgroup Bridge have the following identical settings. • IEEE 802.11 Mode • Channel Bandwidth • Channel (Auto is not recommended) **Note:** *It is highly recommended that static channel is configured on both APs. Do not use Auto channel option when you enable Workgroup Bridge, as both APs in a Workgroup Bridge link must be on the same radio channel. If Auto option is configured, there is chance two access points run on different channels and Workgroup Bridge link cannot establish.* Workgroup Bridge and WDS will not work at the same time. When Workgroup Bridge is enabled, WDS will be disabled automatically.
Remote AP Settings	
SSID	Enter the name of the SSID to which Workgroup Bridge will connect. Click *Site Survey* button to choose from the list. Workgroup Bridge must connect to a remote access point.
Remote MAC Address	Normally, Workgroup Bridge connects to a remote access point by matching SSID. When multiple remote access points have the same SSID, Workgroup Bridge can connect to different remote access points. Optional: You can specify the MAC address of the remote access point to limit Workgroup Bridge's connection to a specific remote access point. The format is xx:xx:xx:xx:xx:xx.

Security Mode	Select the desired mode from the list. • Disabled • WPA-Personal • WPA2-Personal • WPA-Enterprise • WPA2-Enterprise
Connection Status	Connected or Not Connected.

Advanced Settings

Configure advanced parameters.

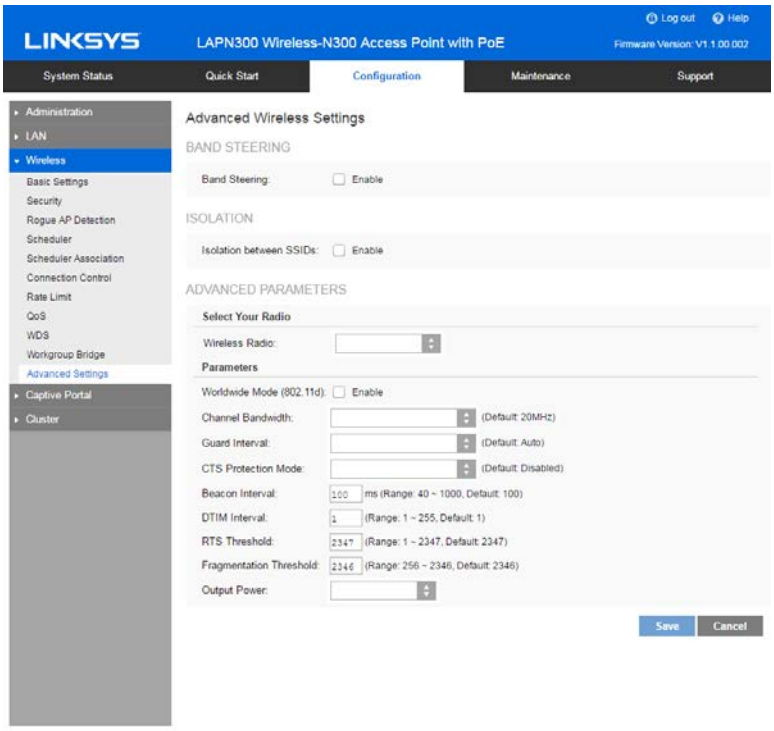


Figure 32: Advanced Settings

Advanced Settings Screen

Band Steering	
Band Steering	Enable or disable Band Steering function. Band Steering is a technology that detects whether the wireless client is dual-band capable. If it is, band steering pushes the client to connect to the less-congested 5 GHz network. It does this by actively blocking the client's attempts to connect with the 2.4GHz network.
Isolation	
Isolation between SSIDs	Define whether to isolate traffic between SSIDs. If enabled, wireless clients in different SSIDs cannot communicate with each other. Enabled by default.
Advanced Parameters	
Worldwide Mode (802.11d)	Worldwide Mode (802.11d) enables the access point to direct connected wireless devices to radio settings specific to where in the world the devices are in use.
Channel Bandwidth	You can select the channel bandwidth manually for Wireless-N connections. When it is set to 20MHz, only 20MHz channel is being used.
Guard Interval	Select the guard interval manually for Wireless-N connections. The two options are Short (400 nanoseconds) and Long (800 nanoseconds). The default is Auto.
CTS Protection Mode	CTS (Clear-To-Send) Protection Mode boosts the access point's ability to catch all Wireless-G transmissions, but it severely decreases performance. By default, CTS Protection Mode is disabled, but the access point will automatically enable this feature when Wireless-G devices are not able to transmit to the access point in an environment with heavy 802.11b traffic.
Beacon Interval	The access point transmits beacon frames at regular intervals to announce the existence of the wireless network. Enter the interval between the transmissions of beacon frames. The value range is between 40 and 1000 milliseconds and default is 100 milliseconds.

DTIM Interval	Enter the Delivery Traffic Information Map (DTIM) period, an integer from 1 to 255 beacons. The default is 1 beacon. The DTIM message is an element included in some beacon frames. It indicates which client stations, currently sleeping in low-power mode, have data buffered on the access point awaiting pickup. The DTIM period that you specify indicates how often the clients served by this WAP device should check for buffered data still on the access point awaiting pickup. For example, if you enter 1, clients check for buffered data on the access point at every beacon. If you enter 10, clients check on every 10th beacon.
RTS Threshold	Enter the Request to Send (RTS) Threshold value, an integer from 1 to 2347. The default is 2347 octets. The RTS threshold indicates the number of octets in a Medium Access Control Protocol Data Unit (MPDU) below which an RTS/CTS handshake is not performed. Changing the RTS threshold can help control traffic flow through the access point, especially one with a lot of clients. If you specify a low threshold value, RTS packets are sent more frequently, which consumes more bandwidth and reduces the throughput of the packet. However, sending more RTS packets can help the network recover from interference or collisions that might occur on a busy network, or on a network experiencing electromagnetic interference.

Fragmentation Threshold	Enter the fragmentation threshold, an integer from 256 to 2346. The default is 2346. The fragmentation threshold is a way of limiting the size of packets (frames) transmitted over the network. If a packet exceeds the fragmentation threshold you set, the fragmentation function is activated and the packet is sent as multiple 802.11 frames. If the packet being transmitted is equal to or less than the threshold, fragmentation is not used. Setting the threshold to the largest value (2,346 bytes, which is the default) effectively disables fragmentation. Fragmentation involves more overhead because of the extra work of dividing up and reassembling of frames it requires, and because it increases message traffic on the network. However, fragmentation can help improve network performance and reliability if properly configured.
Output Power	Select the output power of the access point. If many access points exist, lower power can reduce the signal interference among them.

Captive Portal

There are seven configuration screens:

- Global Configuration
- Portal Profiles
- Local User
- Local Group
- Web Customization
- Profile Association
- Client Information

Global Configuration

Change settings and modify captive portal authentication access port number if needed.

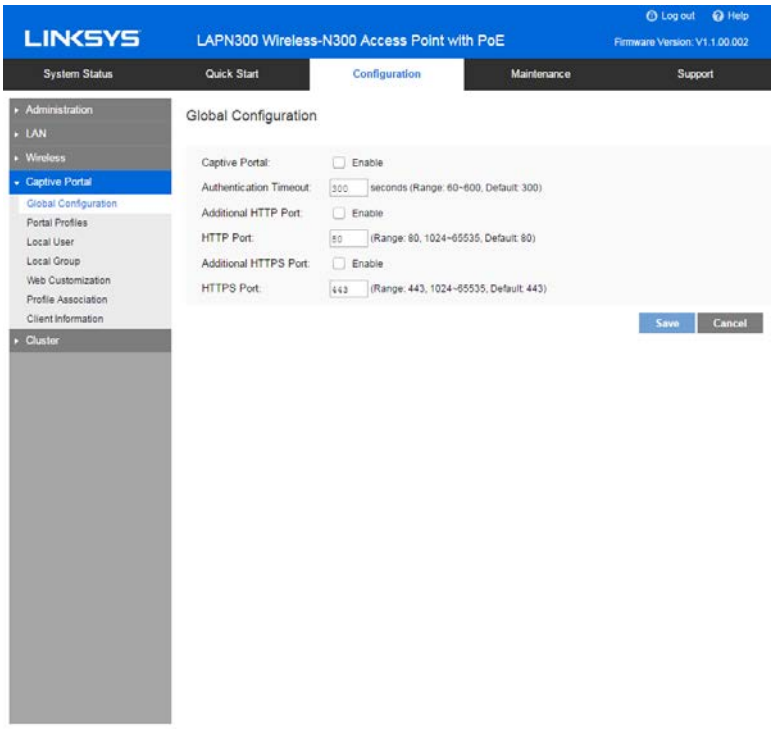


Figure 33: Global Configuration

Global Configuration Screen

Captive Portal	Captive Portal is disabled by default.
Authentication Timeout	The number of seconds the access point keeps an authentication session open with a wireless client. If the client fails to enter authentication credentials within the timeout period, the client may need to refresh the web authentication page. The range is from 60 to 600 seconds. Default is 300.
Additional HTTP Port	HTTP portal authentication uses the HTTP management port by default. You can configure an additional port for that process.
HTTP Port	Define an additional port for HTTP protocol. The value can be 80 or 1024 to 65535 and is 80 by default. If Additional HTTP Port is enabled, the HTTP Port must be different from the HTTP port in "Administration" -> "Management Access" page.
Additional HTTPS Port	HTTPS portal authentication uses the HTTPS management port by default. You can configure an additional port for that process.
HTTPS Port	Define an additional port for HTTPS protocol. The value can be 443 or 1024 to 65535 and is 443 by default. If Additional HTTPS Port is enabled, the HTTPS Port must be different from the HTTPS port in "Administration" -> "Management Access" page.

Portal Profiles

Define detailed settings for Captive Portal profile. Create up to two profiles.

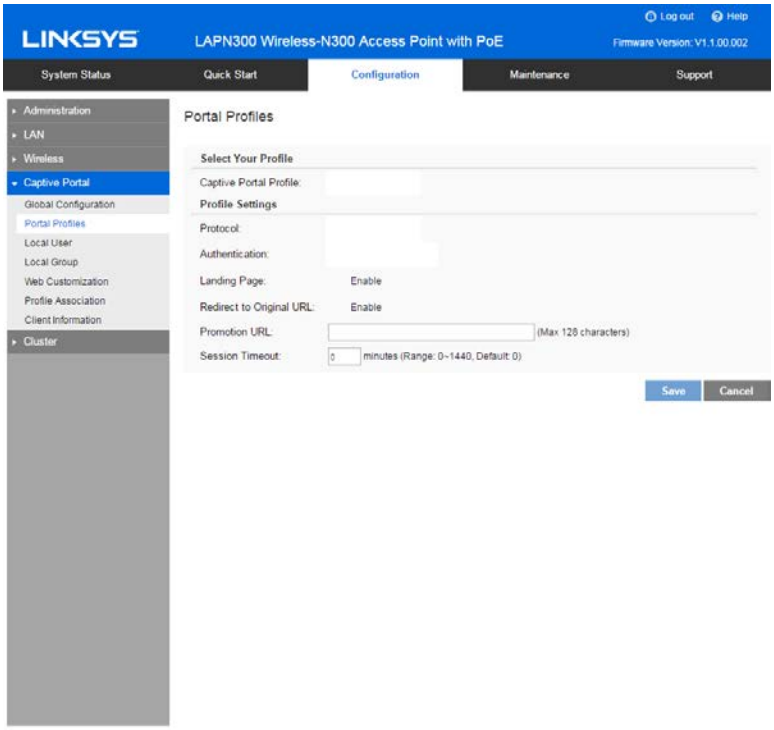


Figure 34: Portal Profiles

Portal Profiles Screen

Portal Profiles	
Captive Portal Profile	Select a profile to configure.
Protocol	Select the protocol used to access the Portal Authentication web server. It can be HTTP or HTTPS.

Authentication	Select an authentication method for clients. Local - The access point uses a local database to authenticate wireless clients. Radius - The access point uses a database on a remote RADIUS server to authenticate wireless clients. The RADIUS server must support EAP-MD5. Password Only - Wireless clients only need a password. Username is unnecessary. No Password - Wireless clients accept defined terms to access the wireless network. Password and username both are unnecessary.
Landing Page	Enable Landing Page to determine where authenticated wireless clients will be directed after logging in at Captive Portal. Choose *Original URL* or *Promotion URL*.
Redirect to Original URL	If Landing Page is enabled, this setting redirects authenticated wireless clients from the Captive Portal login screen to the URL the user typed in.
Promotion URL	Enter a URL to which authenticated clients will be redirected from the Captive Portal login page. Landing Page must be enabled and Redirect to Original URL must be disabled.
Session Timeout	Set the session time in minutes. The access point will disconnect authenticated clients when the session time expires. Session time can range from 0 to 1440 minutes. The default is 0 minutes, which means no timeout.
Local Authentication	
Group Name	Assigns an existing group to the profile. All users who belong to the group are permitted to access the network through this portal. The option 'Default' means a group which includes all users.
Radius Authentication	
Primary Server	Enter the IP address of the RADIUS Server on your network.
Primary Server Port	Enter the port number used for connections to the RADIUS Server.

Primary Shared Secret	Enter the key value to match the RADIUS Server.
Backup Server	The Backup Authentication Server will be used when the Primary Authentication Server is not available.
Backup Server Port	Enter the port number used for connections to the Backup RADIUS Server.
Backup Shared Secret	Enter the key value to match the Backup RADIUS Server.
Password Only Authentication	
Password	The password for the profile. Wireless clients only need one password to access the wireless network.

Local User

Configure user settings for Captive Portal. Local users are used to do local authentication for Captive Portal. Up to 128 users are supported.

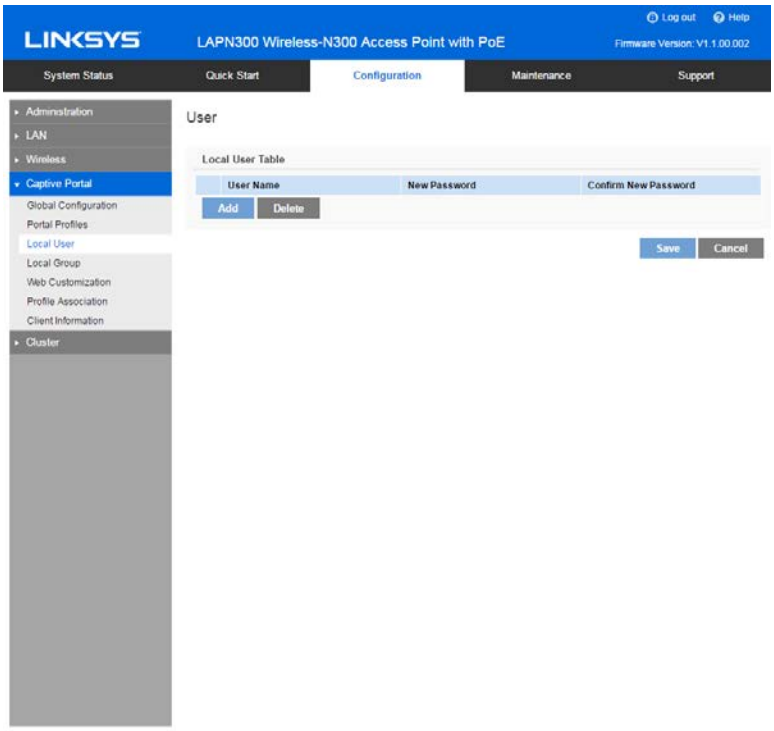


Figure 35: Local User

Local User Screen

User Name	Enter the name of the user account. The user name includes 1 to 32 characters. Special characters except ':' and ';' are allowed.
Password	Enter the New Password of the user account. The password must be between 4 and 32 characters in length. Special characters except ':' and ';' are allowed.
Confirm New Password	Re-enter the new password to confirm it.

Local Group

Configure group settings. Groups are used to include multiple local users and are mapped to Captive Portal profiles. Up to two groups are supported.

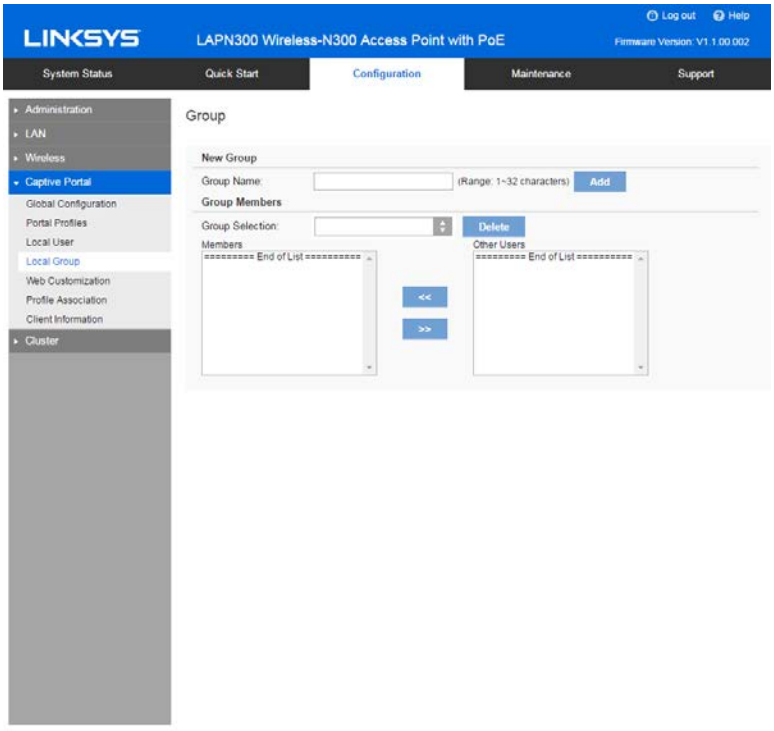


Figure 36: Local Group

Local Group Screen

Group Name	Enter the name of the new group. The group name includes 1 to 32 characters. Special characters except ':' and ';' are allowed. Click **Add**.
Group Selection	Select one group to delete or configure its user members.
Members	User members of the selected group. You can select one user and click ">>" button to remove it.
Other Users	Other users which don't belong to the selected group. You can select one user and click "<<" button to add it into the group.

Web Customization

Each profile may have a customized authentication web page for Captive Portal.

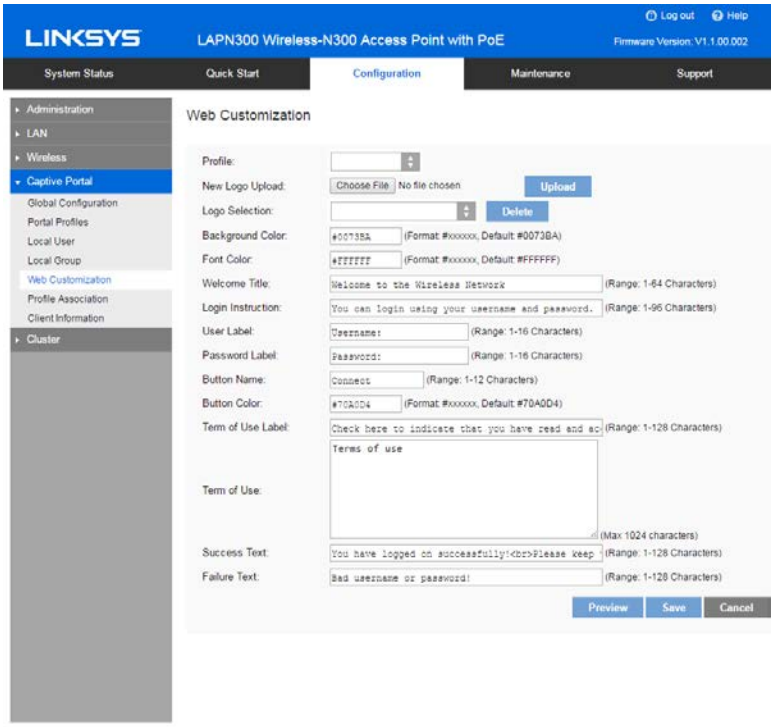


Figure 37: Web Customization

Web Customization Screen

Profile	Select a profile to configure.
New Logo Upload	Logos display in the web page. Select an image file from your local PC and click Upload to add to the images available to select in the next step. Formats .gif, .png and .jpg are supported. File size cannot exceed 5KB. One profile can support one default and one new logo image. If a second new logo is uploaded, it will replace the first new logo.
Logo Selection	Select a logo image from the list.
Background Color	The HTML code for the background color in 6-digit hexadecimal format. The default is #0073BA.
Font Color	The HTML code for the font color in 6-digit hexadecimal format. The default is #FFFFFF.
Welcome Title	Customize text to go with your logo. The default is *Welcome to the Wireless Network.*
Login Instruction	Customize text to go with the login box. Default text for different authentication options: • **Local Authentication/Radius Authentication** You can log in using your username and password. • **Password Only Authentication** You can log in using your password. • **Local Authentication** Click Connect to log in.
User Label	Customize the username text box. Enter up to 16 characters. The default is "Username".
Password Label	Customize the user password text box. Enter up to 16 characters. The default is "Password".
Button Name	Customize the text that appears in the log in button. Enter up to 12 characters. The default is "Connect".
Button Color	The HTML code for the background color of the button in 6-digit hexadecimal format. The default is #70A0D4.

Terms of Use Label	Customize the text to go with the checkbox. Enter up to 128 characters. The default is "Check here to indicate that you have read and accepted the following Terms of Use."
Terms of Use	Customize the text to go with Terms of Use. Enter up to 512 characters. The default is "Terms of Use".
Success Text	Customize the text that shows when the client has been authenticated. The default is "You have logged on successfully! Please keep this window open when using the wireless network."
Failure Text	Customize the text that shows when authentication fails. Enter up to 128 characters. The default is "Bad username or password"

Profile Association

Associate defined Captive Portal profiles with SSIDs.

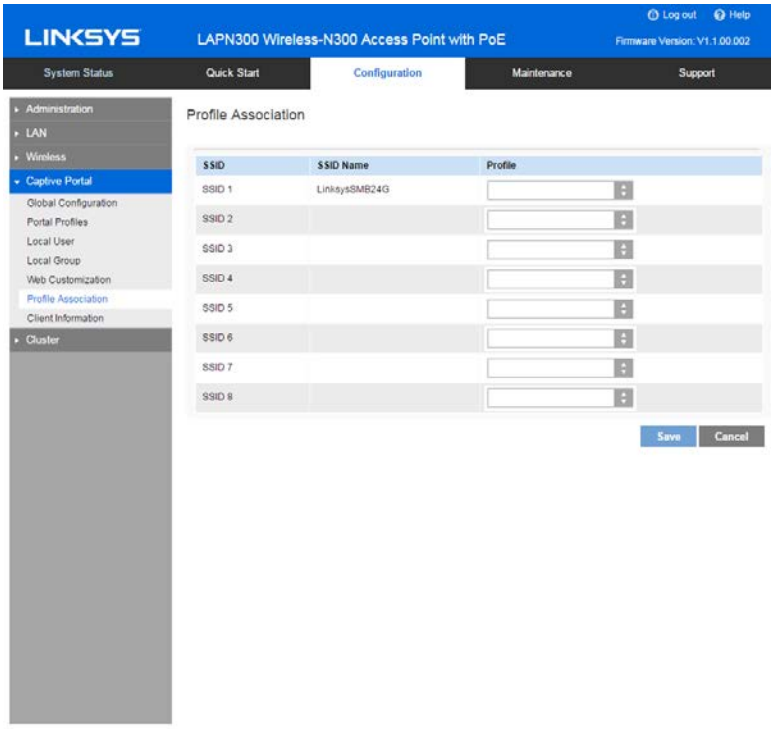


Figure 38: Profile Association

Profile Association Screen

SSID	A list of available SSIDs.
SSID Name	The name of the SSID.
Profile Name	Choose the profile that is associated with the SSID. If the profile associated with the SSID is deleted, then the association will be removed. If *None* is selected, it means no profile is associated.

Client Information

View the status of wireless clients that are authenticated by Captive Portal.

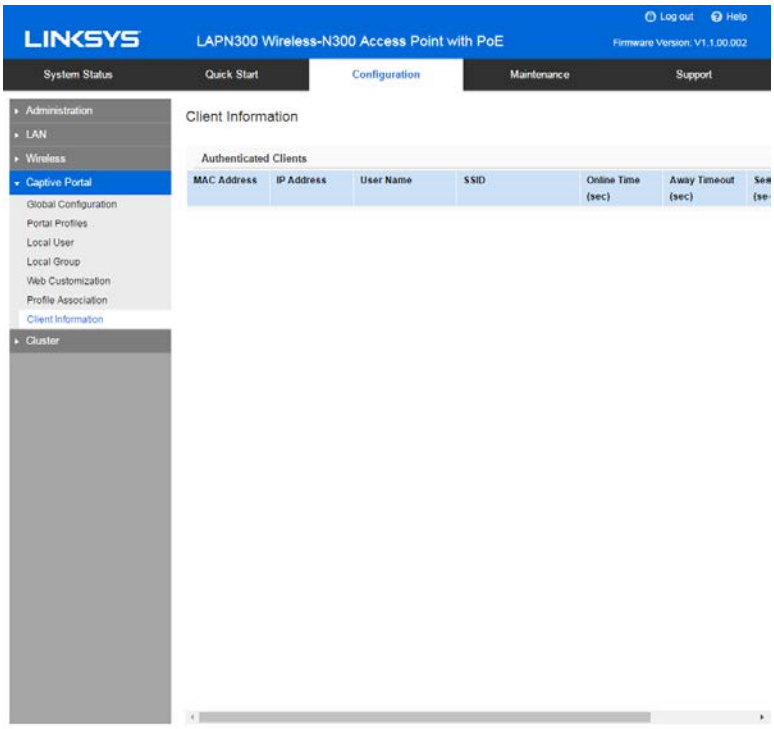


Figure 39: Client Information

Client Information Screen

MAC Address	MAC address of the client.
IP Address	IP address of the client.
User Name	User name used by the client to log in.
SSID Name	Name of the SSID to which the client is connected.
Online Time	How long the client has been online. Measured in seconds.
Away Timeout	The time remaining before de-authentication of a client that disconnects from the SSID. The timer starts when the client disconnect from the SSID. If the time reaches 0, the client is de-authenticated. If the value is fixed to 0, the client will not be de-authenticated as long as the session timeout hasn't expired. Measured in seconds.
Session Timeout	The valid remaining time of the client session. The timer starts when the client is authenticated. After the time reaches 0, the client is de-authenticated. If the value is fixed to 0, the session won't time out. Measured in seconds.

Cluster

The cluster function provides a centralized method to administer and control wireless services across multiple devices. When access points are clustered, you can view, deploy, configure, and secure the wireless network as a single entity.

Note—*Firmware version 1.1.0 or above support cluster feature. If your device has legacy firmware installed, download the latest one from www.linksys.com/support. When you select the firmware file, if the firmware installed in your device is version 1.0.14.001 or older, upgrade your device to firmware version 1.0.16.002 first and then, upgrade device to firmware 1.1.00 or above.*

The access points within a cluster must have the same management VLAN configured. A cluster can support 8 LAPN300 access points as long as they are same model number.

In each cluster, one access point must be manually configured as the master access point. There can only be one master in a cluster. This master will propagate configuration information, such as wireless settings, time settings etc. to the other team members within a cluster. Log in to the master access point to change sharable parameter settings instead of slaves.

When firmware is upgraded on the master, all slaves within the same cluster will receive the upgrade.

Clustered access points share these configurations:

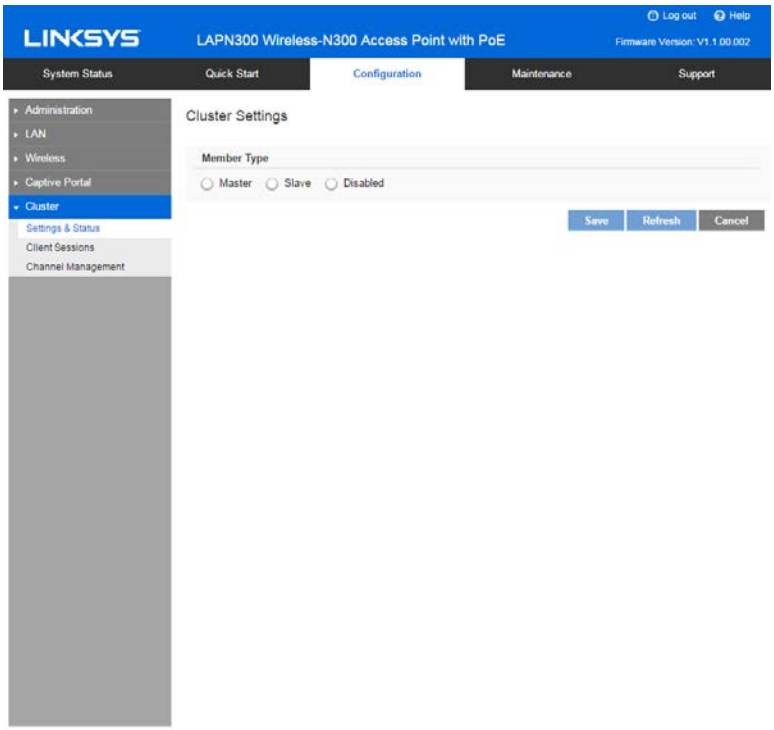
- User Accounts
- Time Settings
- Log Settings
- Management Access
- Discovery Settings
- IGMP/MLD Snooping
- Wireless Network Mode
- SSID Settings
- Wireless Security
- Rogue AP Detection
- Wireless Scheduler
- Wireless Scheduler Association
- Wireless Connection Control
- Rate Limit
- QoS
- Advanced Wireless Settings
- Captive Portal Settings
- Ethernet Port Settings
- VLAN Settings

These configurations are not shared by clustered access points:

- IP Settings
- WDS
- Output Power
- Hostname
- Workgroup Bridge
- Wireless Channel
- 802.1x Supplicant

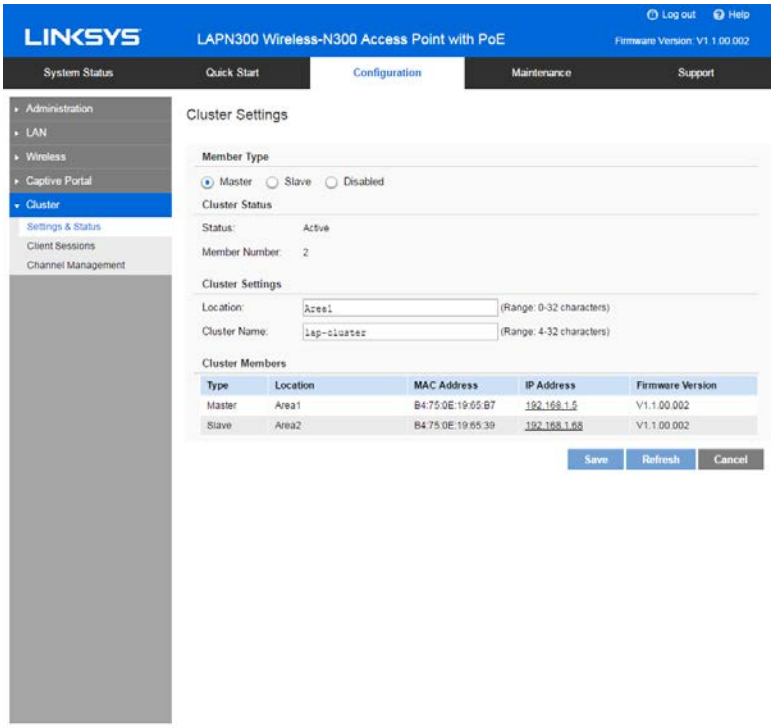
Settings & Status

Manage the AP cluster function. Choose a member type.



Type	Disabled—Disable the cluster function. Master—Enable the cluster function and assign the access point to be the master. **Note**— *If system detects there is one Master already existed in the same cluster, the new access point that likes to become master will be assigned to slave automatically.* Slave—Enable the cluster function and assign the access point to be the slave. **Note**—*When the cluster function is enabled, WDS and workgroup bridge will be disabled automatically.*

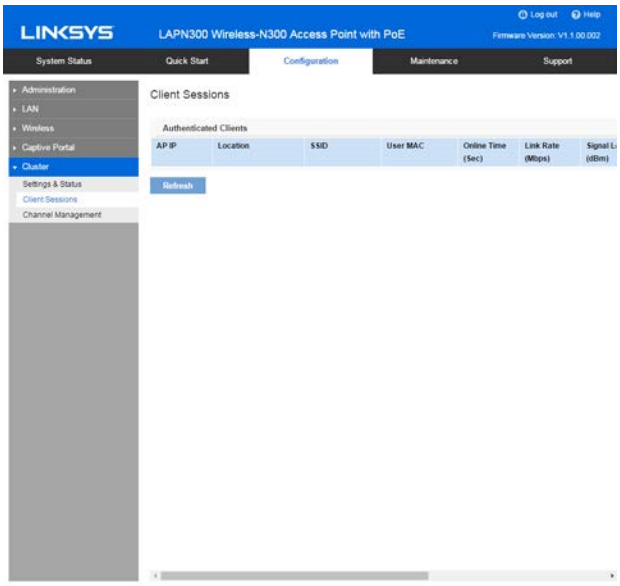
Master


LINKSYS
LAPN300 Wireless-N300 Access Point with PoE
Log out
Help
Firmware Version: V1.1.00.002
System Status
Quick Start
Configuration
Maintenance
Support
Administration
LAN
Wireless
Captive Portal
Cluster
Settings & Status
Client Sessions
Channel Management
Cluster Settings
Member Type
Master
Slave
Disabled
Cluster Status
Status: Active
Member Number: 2
Cluster Settings
Location: Area1 (Range: 0-32 characters)
Cluster Name: lap-cluster (Range: 4-32 characters)
Cluster Members
Type
Location
MAC Address
IP Address
Firmware Version
Master
Area1
B4:75:0E:19:65:B7
192.168.1.5
V1.1.00.002
Slave
Area2
B4:75:0E:19:65:39
192.168.1.68
V1.1.00.002
Save
Refresh
Cancel

Status	Disabled—Cluster function is disabled. Active—Cluster function is enabled and master is active. Active (Backup Master)—Cluster function is enabled and backup master is active. Inactive (Cannot reach the master)—Cluster function is enabled but it's inactive because device cannot reach the master.
Member Number	Number of the members active in the cluster. If an access point joins the cluster but is powered off or cannot reach the master, it is not counted.
Location (Optional)	Where the access point is physically located; for example, Reception. Length is from 0 to 32 bytes.
Cluster Name	Name of the cluster for the LAP device to join; for example, "lab cluster". All access points with the same cluster name belong to the same cluster. Length of this value is from 4 to 32 bytes and special characters are allowed. This is a mandatory field if the cluster function is turned on.
Backup Master	When an access point works as a cluster slave, it can be enabled as a backup master. When master gets offline, it will take the role of master. When the backup master begins to work, it will send advertisements and slaves will send keep-alive and report sessions to it. When shareable settings are modified in it, it will share them to all slaves. When master gets online again, this backup master AP will stop the master function and let original master AP take over master role.

Client Sessions

See the status of wireless clients within the cluster.



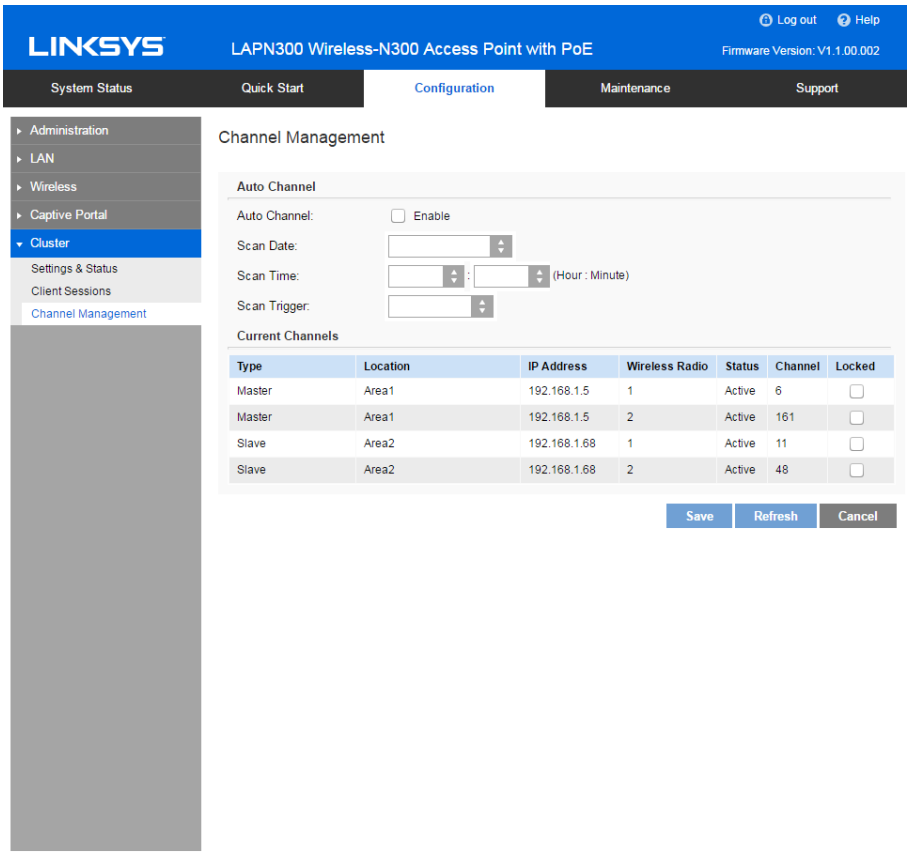
The session is the period of time in which a user on a client device (station) with a unique MAC address maintains a connection with the wireless network. The session begins when the WLAN client logs on to the network, and the session ends when the WLAN client either logs off intentionally or loses the connection for some other reason.

When one wireless client of Captive Portal roams from one access point to another in the same cluster, it need not re-authenticate.

IP Address	IP address of the access point to which the client connects.
Location	Location of the access point to which the client connects.
SSID	SSID name of the access point to which the client connects.
User MAC	MAC address of the client.
Online Time	Displays how long this client has been online since it is authenticated. Unit is second.
Link Rate	Indicates the link rate of the client. Unit is Mbps.
Signal	The signal strength of the client is displayed. Unit is dBm.
Rx Total	The total bytes which are received from the client by the access point. Unit is Byte.
Tx Total	The total bytes which are sent to the client by the access point. Unit is Byte.
Rx Rate	Current transfer rate of the data which are received from the client by the access point. Unit is Kbps.
Tx Rate	Current transfer rate of the data which are sent to the client by the access point. Unit is Kbps.

Channel Management

Manage the channel assignments for access points within a cluster.



When channel management is enabled, the access point automatically assigns radio channels within a cluster. Auto channel assignment reduces mutual interference (or interference with other access points outside of its cluster) and maximizes Wi-Fi bandwidth to help maintain efficient communication over the wireless network.

Auto Channel	
Auto Channel	Access point scans available Wi-Fi channels and changes the channel if better network performance is possible. Disabled by default.
Scan Day	Choose the day of the week when Auto Channel scans Wi-Fi channels. You may choose specific days or have the access point scan and select the best channel daily.
Scan Time	Choose the time of day when Auto Channel performs scan.
Scan Trigger	Because Auto Channel will change the channel if it finds a better one, you can choose when to allow a scan. • Immediately – Scan according to the day/time specified. • No Clients – Scan only if no clients are connected to the wireless radio. If there are clients connected, the access point will complete the Auto Channel operation the next scheduled time when no clients are connected.
Current Channels	
Type	Member type of the access point. It can be Master, Slave or Backup Master.
Location	Where the access point is physically located
IP Address	IP address of the access point.
Status	Status of the wireless radio. It can be Active or Inactive.
Channel	Current channel number of the wireless radio.
Locked	Select if you feel the current channel is the best for that radio.

System Status

System Summary

Provides the system status of the access point.

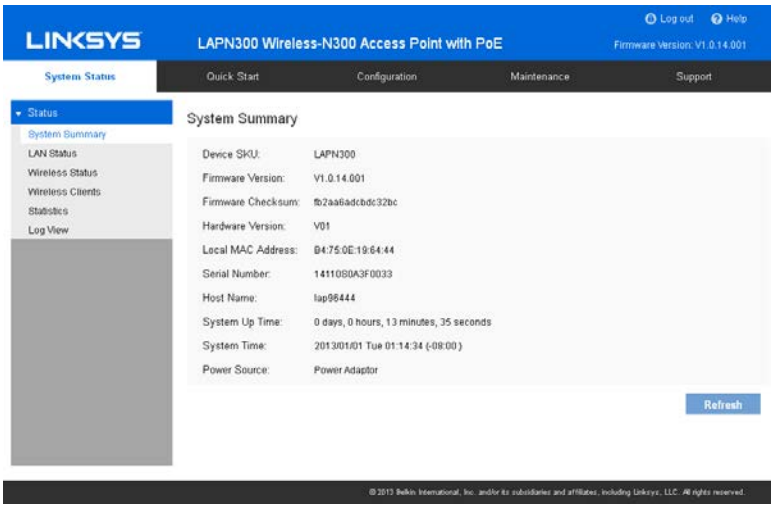


Figure 40: System Summary Screen

System Summary Screen

System Summary	
Device SKU	The SKU is often used to identify device model number and region.
Firmware Version	The version of the firmware currently installed.
Firmware Checksum	The checksum of the firmware running in the access point.
Local MAC Address	The MAC (physical) address of the wireless access point.
Serial Number	The serial number of the device.
Host Name	The host name assigned to the access point.
System Up Time	How long the system has been running since the last restart or reboot.
System Time	The current date and time.
Power Source	The power source of the access point. It can be Power over Ethernet (PoE) or Power Adapter. When two power sources are plugged in, PoE has higher precedence.
Buttons	
Refresh	Click to update the data on the screen.

LAN Status

LAN Status displays settings, and status of LAN interface.

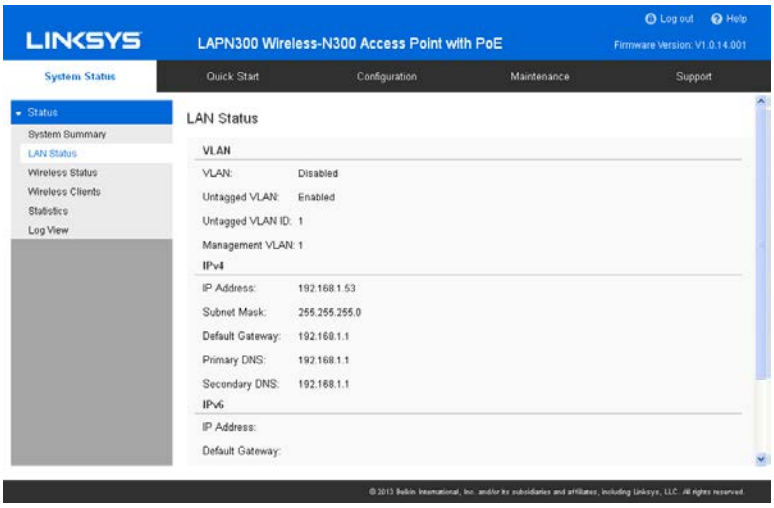


Figure 41: LAN Status Screen

LAN Status Screen

VLAN	
VLAN	Enabled or disabled (default).
Untagged VLAN	Enabled (default) or disabled. If enabled (default), traffic is untagged when VLAN ID is equal to Untagged VLAN ID and untagged traffic can be accepted by LAN port. If disabled, traffic from the LAN port is always tagged and only tagged traffic can be accepted from LAN port. By default all traffic on the access point uses VLAN 1, the default untagged VLAN.
Untagged VLAN ID	Displays the untagged VLAN ID. Traffic on the VLAN that you specify in this field is not tagged with a VLAN ID when forwarded to the network. VLAN 1 is the default ID for untagged VLAN.
Management VLAN	Displays the Management VLAN ID. The VLAN associated with the IP address you use to connect to the access point. Provide a number between 1 and 4094 for the Management VLAN ID. The default is 1. This VLAN is also the default untagged VLAN. If you already have a management VLAN configured on your network with a different VLAN ID, you must change the VLAN ID of the management VLAN on the access point.

IPv4/v6	
IP Address	The IP address of the wireless access point.
Subnet Mask	The Network Mask (Subnet Mask) for the IP address above.
Default Gateway	Enter the gateway for the LAN segment to which the wireless access point is attached (the same value as the PCs on that LAN segment).
Primary DNS	The primary DNS address provided by the DHCP server or configured manually.
Secondary DNS	The secondary DNS address provided by the DHCP server or configured manually.

Wireless Status

Wireless Status displays settings and status of the wireless radio and SSID.

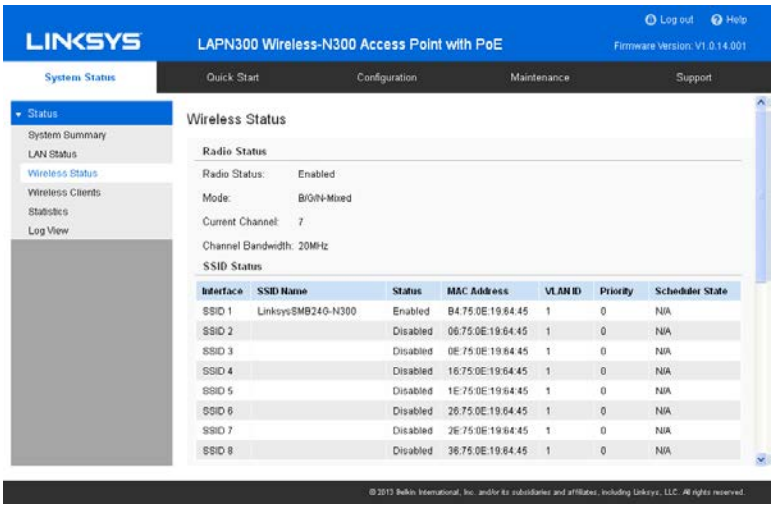


Figure 42: Wireless Status Screen

Wireless Status Screen

Radio Status	
Radio Status	Indicates whether the radio is enabled.
Mode	Current 802.11mode (a/b/g/n) of the radio.
Channel	The channel currently in use.
Channel Bandwidth	Current channel bandwidth of the radio. When set to 20 MHz, only the 20 MHz channel is in use.

SSID Status	
Interface	SSID index.
SSID Name	Name of the SSID.
Status	Status of the SSID, enabled or disabled.
MAC Address	MAC address of the SSID.
VLAN ID	VLAN ID of the SSID.
Priority	The 802.1p priority of the SSID.
Scheduler State	Current scheduler status of the SSID. • N/A No scheduler is enabled on the SSID, or the SSID is disabled by administrator. • Active The SSID is enabled. • Inactive The SSID is disabled.
WDS Root	
Status	Status of the WDS Root: Enabled or Disabled.
Local MAC	MAC Address of the WDS Root.
Local SSID	Name of the WDS Root.
VLAN List	VLAN List of the WDS Root. When the VLAN function is enabled, WDS Root only receives packets in the VLAN list from WDS Stations. Packets not in the list will be dropped.
WDS Station	
Interface	The index of WDS Station.
Status	Status of the WDS Station: Enabled or Disabled.
Local MAC	MAC Address of the WDS Root.

Remote SSID	SSID of the destination access point which is on the other end of the WDS link to which data is sent or handed-off and from which data is received.
Remote MAC	MAC Address of the destination access point which is on the other end of the WDS link to which data is sent or handed-off and from which data is received.
Connection Status	Status of the WDS Station. It can be Disabled, Connected or Not Connected.
Workgroup Bridge	
Status	Status of the Workgroup Bridge: enabled or disabled.
Local MAC	MAC address of the Workgroup Bridge.
Remote SSID	SSID of the destination access point on the other end of the Workgroup Bridge link to which data is sent and from which data is received.
Remote MAC	MAC address of the destination access point on the other end of the Workgroup Bridge link to which data is sent and from which data is received.
Connection Status	Status of the Workgroup Bridge: disabled, connected or not connected.

Wireless Clients

Wireless Clients displays a list of connected clients based on each wireless interface.

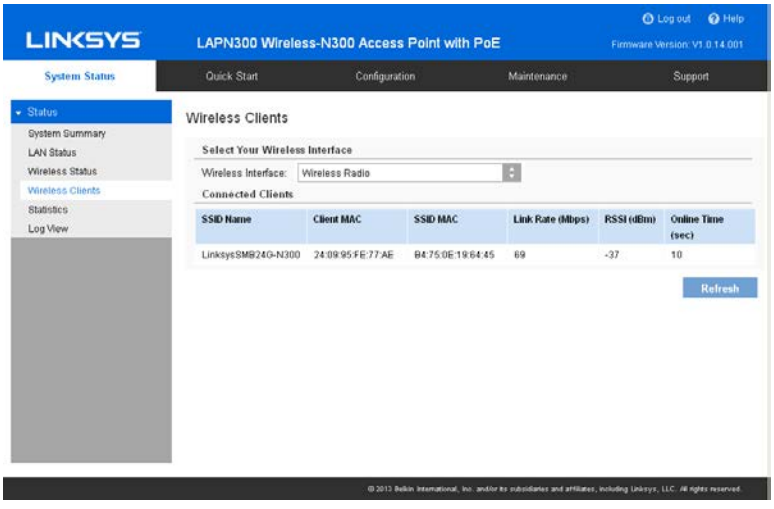


Figure 43: Wireless Clients Screen

Wireless Clients Screen

Select Your Wireless Interface	
Wireless Interface	Select the desired interface from the list. The interfaces include eight SSIDs.
Connected Clients	
SSID Name	Name of the SSID to which the client connects.
Client MAC	The MAC address of the client.
SSID MAC	MAC of the SSID to which the client connects.
Link Rate	The link rate of the client. Measured in Mbps.
RSSI	The signal strength of the client. Measured in dBm.
Online Time	How long this client has been online. Measured in seconds.

Statistics

Statistics provides real-time statistics on transmitted and received data based on SSID and LAN interface.

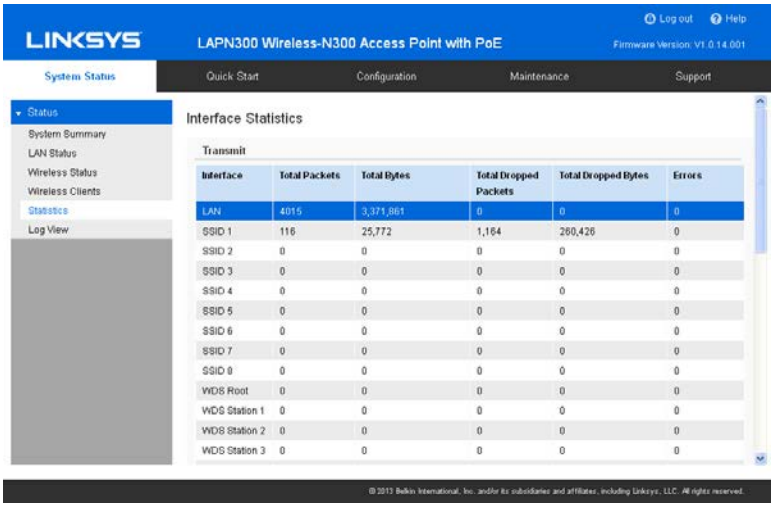


Figure 44: Statistics Screen

Statistics Screen

Transmit/Receive	Total Packets - The total packets sent (in Transmit table) or received (in Received table) by the interface. Total Bytes - The total bytes sent (in Transmit table) or received (in Received table) by the interface. Total Dropped Packets - The total number of dropped packets sent (in Transmit table) or received (in Received table) by the interface. Total Dropped Bytes - The total number of dropped bytes sent (in Transmit table) or received (in Received table) by the interface. Errors - The total number of errors related to sending and receiving data on this interface.

Log View

Log View shows a list of system events that are generated by each single log entry, such as login attempts and configuration changes.

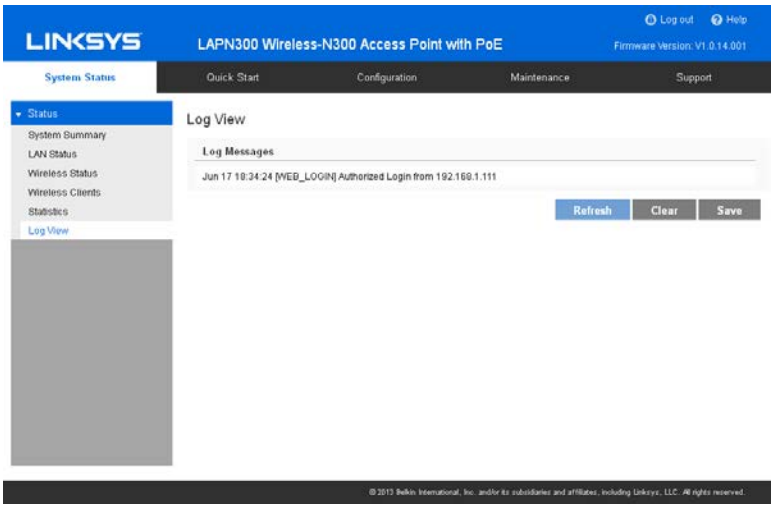


Figure 45: Log View Screen

Log View Screen

Log Messages	
Log Messages	Show the log messages.
Buttons	
Refresh	Update the data on screen.
Save	Save the log to a file on your PC.
Clear	Delete the existing logs from your device.

Maintenance

This chapter covers features available on the wireless access point's *Maintenance* menu.

Maintenance

- Firmware Upgrade
- Configuration Backup/Restore
- Factory Default
- Reboot

Diagnostics

- Ping Test
- Packet Capture
- Diagnostic Log

Firmware Upgrade

The firmware (software) in the wireless access point can be upgraded by using HTTP/HTTPS, or TFTP.

Check the Linksys support website (http://www.linksys.com/support) and download the latest firmware release to your storage such as PC. Then, perform firmware upgrade by following the steps below.

During firmware upgrade, do not power off device or disconnect the Ethernet cable. The access point will reboot automatically after firmware upgrade is completed.

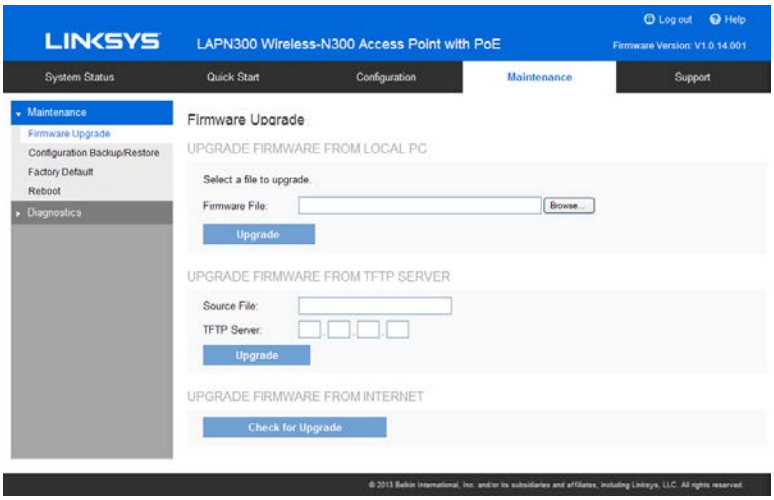


Figure 46: Firmware Upgrade Screen

To perform the firmware upgrade from local PC:

1. Click the *Browse* button and navigate to the location of the upgrade file.
2. Select the upgrade file. Its name will appear in the *Upgrade File* field.
3. Click the *Upgrade* button to commence the firmware upgrade.

To perform the firmware upgrade from TFTP server:

1. Enter the IPv4 address of the TFTP server and the source file. The source file is the firmware filename you stored in your TFTP server.
2. Click the *Upgrade* button to commence the firmware upgrade.

Configuration Backup/Restore

Configuration backup/restore allows you to download the configuration file from the access point to external storage. You can save to your PC or networked storage, or upload a previously saved configuration file from external storage to your access point. It is highly recommended you save one extra copy of the configuration file to external storage after you are done with access point setup.

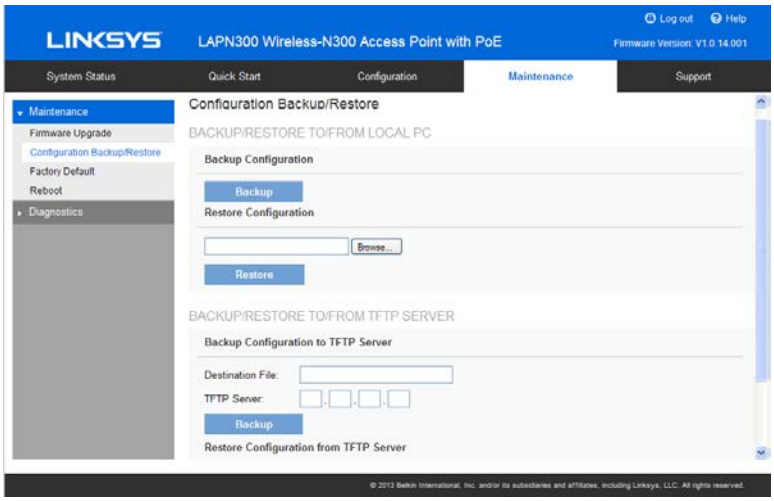


Figure 47: Configuration Backup/Restore Screen

Configuration Backup/Restore Screen

Backup/Restore to/from Local PC	
Backup Configuration	Once you have the access point working properly, you should back up the settings to a file on your computer. You can later restore the access point's settings from this file, if necessary. To create a backup file of the current settings, click **Backup**. If you don't have your browser set up to save downloaded files automatically, locate where you want to save the file, rename it if you like, and click **Save**.
Restore Configuration	To restore settings from a backup file: 1. Click **Browse**. 2. Locate and select the previously saved backup file. 3. Click **Restore.**
Backup/Restore to/from TFTP server	
Backup Configuration	To create a backup file of the current settings: 1. Enter the destination file name you plan to save in TFTP server. 2. Enter the IPv4 address for the TFTP server. 3. Click **Backup.**
Restore Configuration	To restore settings from a backup file: 1. Enter the source file name stored in TFTP server. 2. Enter the IPv4 address for the TFTP server. 3. Click **Restore**.

Factory Default

It's highly recommended you save your current configuration file before you restore to factory default settings. To save your current configuration file, click *Maintenance* > *Configuration Backup/Restore*. Select *Yes* and click **Save**.

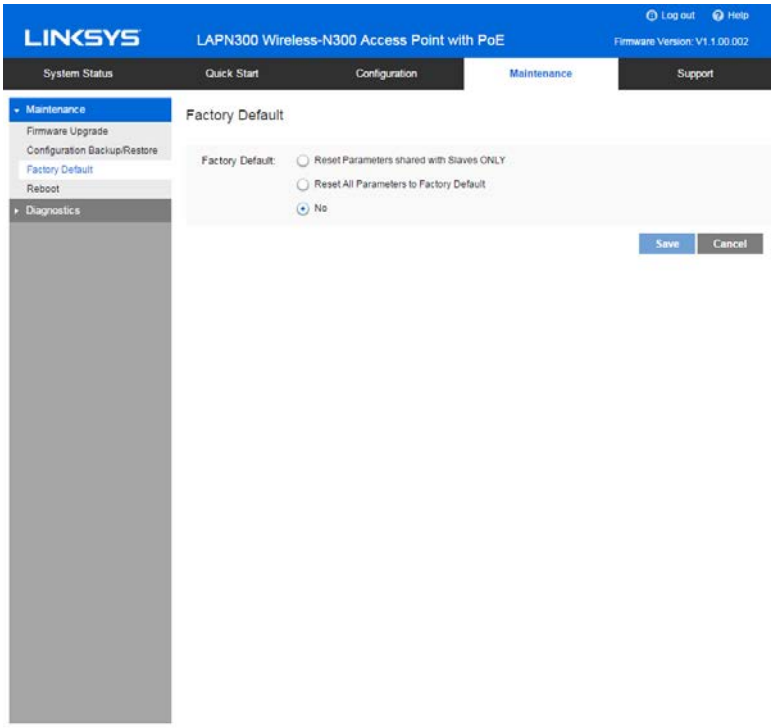


Figure 48: Factory Default Screen

Factory Default Screen

Factory Default	To restore your access point to its factory defaults, select an option and click **Save**. • Reset Parameters that can share with Slaves ONLY When current AP is a master of a cluster, select this option to restore all sharable parameters of current AP and its slaves to factory defaults. Cluster settings and non-sharable parameters will not reset. • Reset All Parameters to Factory Default • No. Don't restore to factory defaults.

Reboot

Reboot power cycles the device. The current configuration file will remain after reboot.

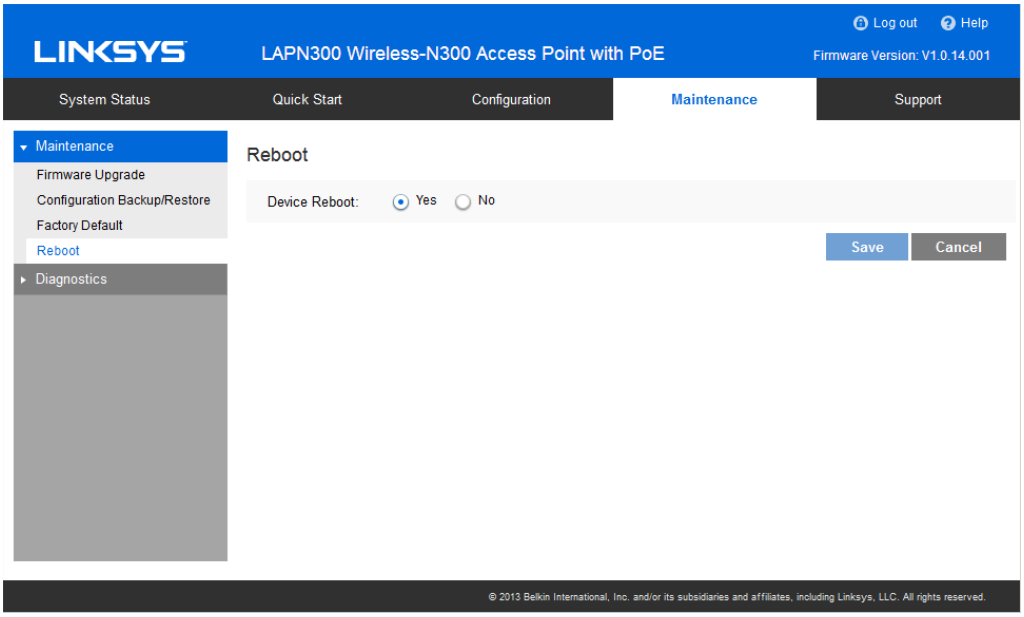


Figure 49: Reboot Screen

Reboot Screen

Device Reboot	Select *Yes* and click **Save** to power cycle the access point.

Ping Test

Determine the accessibility of a host on the network.

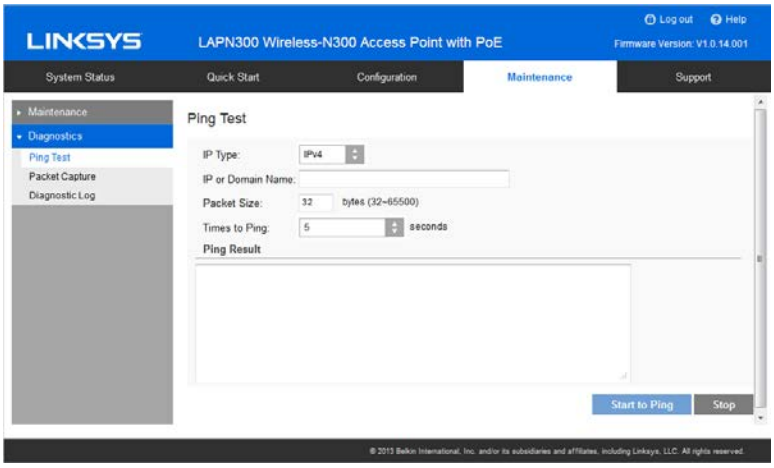


Figure 50: Ping Test Screen

Ping Test Screen

General	
IP Type	Enter the IP type of destination address.
IP or URL Address	Enter the IP address or domain name that you want to ping.
Packet Size	Enter the size of the packet.
Times to Ping	Select the desired number from the drop-list. • 5 • 10 • 15 • Unlimited

Packet Capture

Capture and store received and transmitted 802.3 packets based on one specified network interface. Network interface can be SSID or LAN.

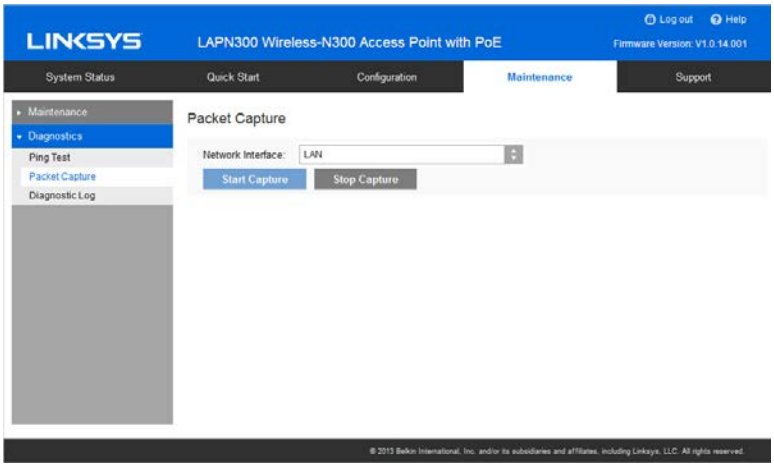


Figure 51: Packet Capture Screen

Packet Capture Screen

Network Interface	Select the desired network interface from the drop-down list. The interface can be SSID or Ethernet.
Start Capture	Click to start the capture. You will be asked to specify a local file to store the packets.
Stop Capture	Click to stop the capture.

Diagnostic Log

Diagnostic Log provides system detail information such as configuration file, system status and statistics data, hardware information, operational status. The information is useful in troubleshooting and working with technical support.

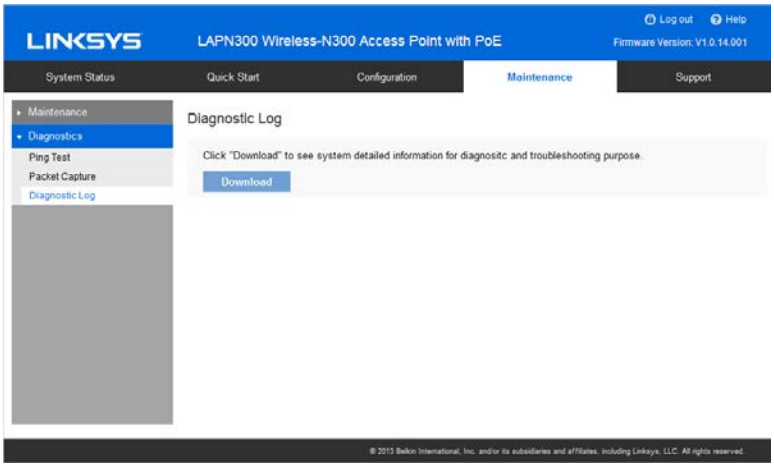


Figure 52: Diagnostic Screen

Diagnostic Log Screen

Download	Click to download the device diagnostic log into a local file.

Appendix A – Troubleshooting

Overview

This chapter covers some common problems encountered while using the wireless access point, and some possible solutions to them. If you follow the suggested steps and the wireless access point still does not function properly, contact your dealer for further advice.

General Problems

Problem 1: I can't find the access point on my network.

Solution 1: Check the following:

Make sure the wireless access point is properly installed, LAN connections are OK, and it is powered on. Check the LEDs for system and port status.

Ensure that your PC and the wireless access point are on the same network segment. (If you don't have a router, this must be the case.)

You can use the following method to determine the IP address of the wireless access point, and then try to connect using the IP address, instead of the name.

To find the access point's IP address:

Open a MS-DOS Prompt or Command Prompt Window.

Use the Ping command to ping the wireless access point. Enter "ping" followed by the default name of the wireless access point. The default name is a string with "lap" and the last 5 characters of device MAC address; e.g., ping lap964f4.

Check the output of the ping command to determine the IP address of the wireless access point, as shown below.

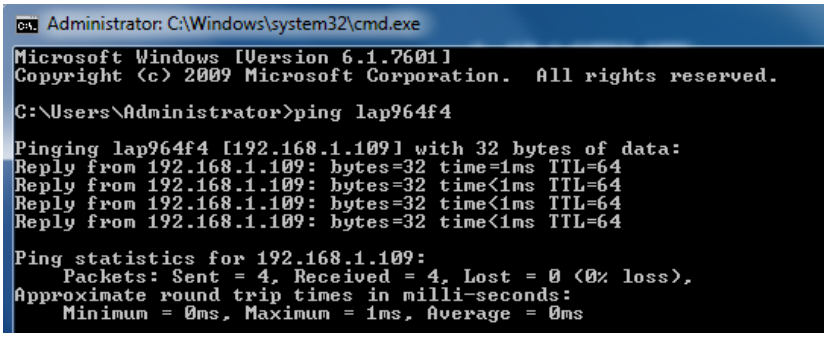


Figure 53: Ping

If your PC uses a fixed (static) IP address, ensure that it is using an IP address that is in the network segment (subnet) with the wireless access point. On Windows PCs, you can use *Control Panel->Network* to check the properties for the TCP/IP protocol.

If there is no DHCP server found, the wireless access point will roll back to an IP address and mask of 192.168.1.252 and 255.255.255.0.

Problem 2: My PC can't connect to the LAN via the wireless access point.

Solution 2: Check the following:

- The SSID and security settings on the PC match the settings on the wireless access point.
- On the PC, the wireless mode is set to *Infrastructure*.
- If using the Access Control feature, the PC's name and address is in the *Trusted Stations* list.

If using 802.1x mode, ensure the PC's 802.1x software is configured correctly. See *Appendix C* for details of setup for the Windows XP 802.1x client. If using a different client, refer to the vendor's documentation.

Appendix B – About Wireless LANs

Overview

Wireless networks have their own terms and jargon. You should understand these terms in order to configure and operate a wireless LAN.

Wireless LAN Terminology

Modes

Wireless LANs can work in either of two modes:

- Ad-hoc
- Infrastructure

Ad-hoc Mode

Ad-hoc mode does not require an access point or a wired (Ethernet) LAN. Wireless stations, e.g., notebook PCs with wireless cards, communicate directly with each other.

Infrastructure Mode

In Infrastructure Mode, one or more access points are used to connect wireless stations, e.g., notebook PCs with wireless cards, to a wired (Ethernet) LAN. The wireless stations can then access all LAN resources.

Note—*Access points can only function in Infrastructure Mode, and can communicate only with wireless stations that are set to Infrastructure Mode.*

SSID/ESSID

BSS/SSID

A group of wireless stations and a single access point, all using the same ID (SSID), form a Basic Service Set (BSS).

Using the same SSID is essential. Devices with different SSIDs are unable to communicate with each other.

ESS/ESSID

A group of wireless stations, and multiple access points, all using the same ID (ESSID), form an Extended Service Set (ESS).

Different access points within an ESS can use different channels. To reduce interference, it is recommended that adjacent access points SHOULD use different channels.

As wireless stations are physically moved through the area covered by an ESS, they will automatically change to the access point that has the least interference or best performance. This capability is called Roaming. (Access points do not have or require roaming capabilities.)

Channels

The wireless channel sets the radio frequency used for communication.

- Access points use a fixed channel. You can select the channel used. This allows you to choose a channel that provides the least interference and best performance. For USA and Canada, the following channels are available.
  2.4GHz:
  - 2.412 to 2.462 GHz; 11 channels

  5GHz:
  - 5.180 to 5.240 GHz; 4 channels
  - 5.745 to 5.825 GHz; 5 channels
- If using multiple access points it is better if adjacent access points use different channels to reduce interference. The recommended channel spacing between adjacent access points is five channels, e.g., use Channels 1 and 6, or 6 and 11.
- In Infrastructure Mode wireless stations normally scan all channels looking for an access point. If more than one access point can be used, the one with the strongest signal is used. (This can only happen within an ESS.)
- If using Ad-hoc Mode (no access point) all wireless stations should be set to use the same channel. However, most wireless stations will still scan all channels to see if there is an existing ad-hoc group they can join.

WEP

WEP (Wired Equivalent Privacy) is a standard for encrypting data before it is transmitted. This is desirable because it is impossible to prevent snoopers from receiving any data transmitted by your wireless stations. If the data is encrypted, it is meaningless unless the receiver can decrypt it.

Note—*If WEP is used, the wireless stations and the wireless access point must have the same settings.*

WPA-PSK

In WPA-PSK, like WEP, data is encrypted before transmission. WPA is more secure than WEP. The PSK (Pre-shared Key) must be entered on each wireless station. The 256-bit encryption key is derived from the PSK, and changes frequently.

WPA2-PSK

This is a further development of WPA-PSK, and offers even greater security, using the AES (Advanced Encryption Standard) method of encryption. It should be used if possible.

WPA-Enterprise

This version of WPA requires a RADIUS server on your LAN to provide the client authentication according to the 802.1X standard. Data transmissions are encrypted using the WPA standard.

If this option is used:

- The access point must have a "client login" on the RADIUS server.
- Each user must have a "user login" on the RADIUS server.
- Each user's wireless client must support 802.1X and provide the login data when required.

All data transmission is encrypted using the WPA standard. Keys are automatically generated, so no key input is required.

WPA2-Enterprise

This version of WPA2 requires a RADIUS server on your LAN to provide the client authentication according to the 802.1X standard. Data transmissions are encrypted using the WPA2 standard.

If this option is used:

- The access point must have a "client login" on the RADIUS server.
- Each user must have a "user login" on the RADIUS server.
- Each user's wireless client must support 802.1X and provide the login data when required.

All data transmission is encrypted using the WPA2 standard. Keys are automatically generated, so no key input is required.

802.1x

This uses the 802.1X standard for client authentication, and WEP for data encryption. If possible, you should use WPA-Enterprise instead, because WPA encryption is much stronger than WEP encryption.

If this option is used:

- The access point must have a "client login" on the RADIUS server.
- Each user must have a "user login" on the RADIUS server.
- Each user's wireless client must support 802.1X and provide the login data when required.

All data transmission is encrypted using the WEP standard. You only have to select the WEP key size; the WEP key is automatically generated.

Appendix C – PC and Server Configuration

Overview

All wireless stations need to have settings that match the wireless access point. These settings depend on the mode in which the access point is being used.

- If using WEP or WPA2-PSK, it is only necessary to ensure that each wireless station's settings match those of the wireless access point, as described below.
- For 802.1x modes, configuration is much more complex. The RADIUS server must be configured correctly, and setup of each wireless station is also more complex.

Using WEP

For each of the following items, each wireless station must have the same settings as the wireless access point.

Mode	On each PC, the mode must be set to *Infrastructure*.
SSID (ESSID)	This must match the value used on the wireless access point. The default value is LinksysSMB24G. Note: The SSID is case sensitive.
Wireless Security	• Each wireless station must be set to use WEP data encryption. • The key size (64 bit, 128 bit) must be set to match the access point. • The key values on the PC must match the key values on the access point. **Note—***On some systems, the key sizes may be shown as 40-bit and 104-bit instead of 64-bit, 128-bit. This is because the key input by the user is 24 bits less than the key size used for encryption.*

Using WPA2-PSK

For each of the following items, each wireless station must have the same settings as the wireless access point.

Mode	On each PC, the mode must be set to *Infrastructure*.
SSID (ESSID)	This must match the value used on the wireless access point. The default value is LinksysSMB24G. Note The SSID is case sensitive.

Wireless Security	On each client, wireless security must be set to WPA2-PSK. • The Pre-shared Key entered on the access point must also be entered on each wireless client. • The Encryption method (e.g. TKIP, AES) must be set to match the access point.

Using WPA2-Enterprise

This is the most secure and most complex system.

WPA-Enterprise mode provides greater security and centralized management, but it is more complex to configure.

Wireless Station Configuration

For each of the following items, each wireless station must have the same settings as the wireless access point.

Mode	On each PC, the mode must be set to *Infrastructure*.
SSID (ESSID)	This must match the value used on the wireless access point. The default value is LinksysSMB24G. **Note—***The SSID is case sensitive.*
802.1x Authentication	Each client must obtain a certificate for authentication for the RADIUS server.
802.1x Encryption	Typically, EAP-TLS is used. This is a dynamic key system, so keys do NOT have to be entered on each wireless station. You can also use a static WEP key (EAP-MD5). The wireless access point supports both methods simultaneously.

RADIUS Server Configuration

If using WPA2-Enterprise mode, the RADIUS server on your network must be configured as follows.

- It must provide and accept certificates for user authentication.

- There must be a "client login" for the wireless access point itself.

The wireless access point will use its default name as its client login name. (However, your RADIUS server may ignore this and use the IP address instead.)

The *Shared Key*, set on the *Security* Screen of the access point, must match the *Shared Secret* value on the RADIUS server.

Encryption settings must be correct.

802.1x Server Setup (Windows 2000 Server)

This section describes using *Microsoft Internet Authentication Server* as the RADIUS server, since it is the most common RADIUS server available that supports the EAP-TLS authentication method.

The following services on the Windows 2000 Domain Controller (PDC) are also required.

- dhcpd
- dns
- rras
- webserver (IIS)
- RADIUS Server (Internet Authentication Service)
- Certificate Authority

Windows 2000 Domain Controller Setup

Run *dcpromo.exe* from the command prompt.

Follow all of the default prompts, ensure that DNS is installed and enabled during installation.

Services Installation

1. Select the *Control Panel* > *Add/Remove Programs*.
2. Click *Add/Remove Windows Components* from the left side.

3. Ensure that the following components are selected.
    a. *Certificate Services*. After enabling this, you will see a warning that the computer cannot be renamed and joined after installing certificate services. Select *Yes* to select certificate services and continue.
    b. *World Wide Web Server*. Select *World Wide Web Server* on the *Internet Information Services (IIS)* component.
    c. From the *Networking Services* category, select *Dynamic Host Configuration Protocol (DHCP)*, and *Internet Authentication Service* (DNS should already be selected and installed).

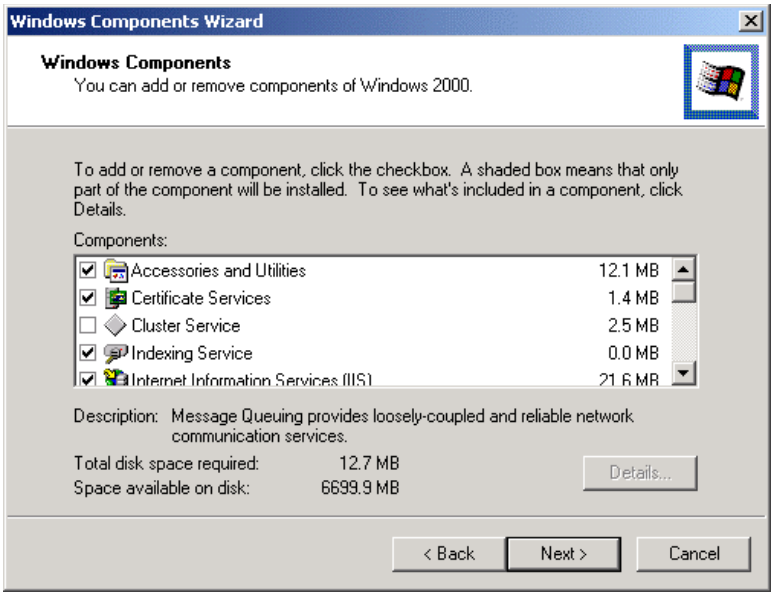


Figure 53: Components Screen

4. Click **Next**.
5. Select the *Enterprise root CA*, and click **Next**.

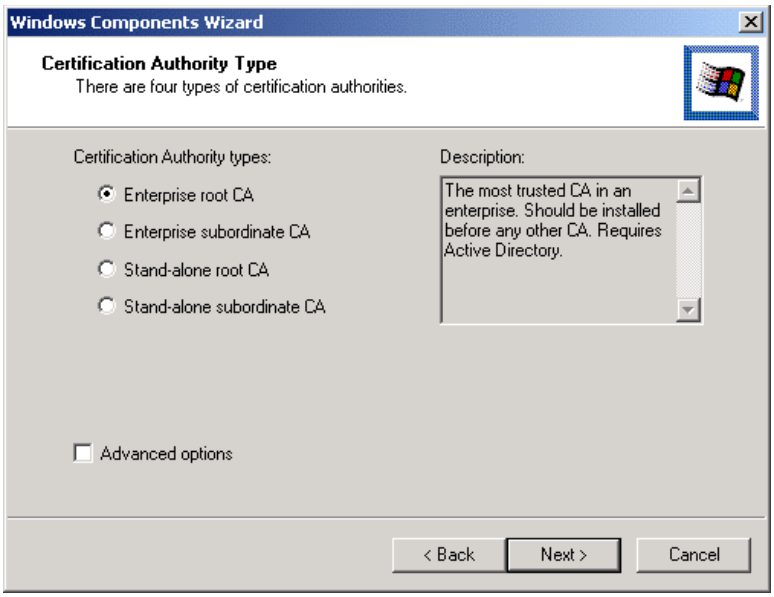


Figure 54: Certification Screen

6. Enter the information for the *Certificate Authority*, and click **Next**.

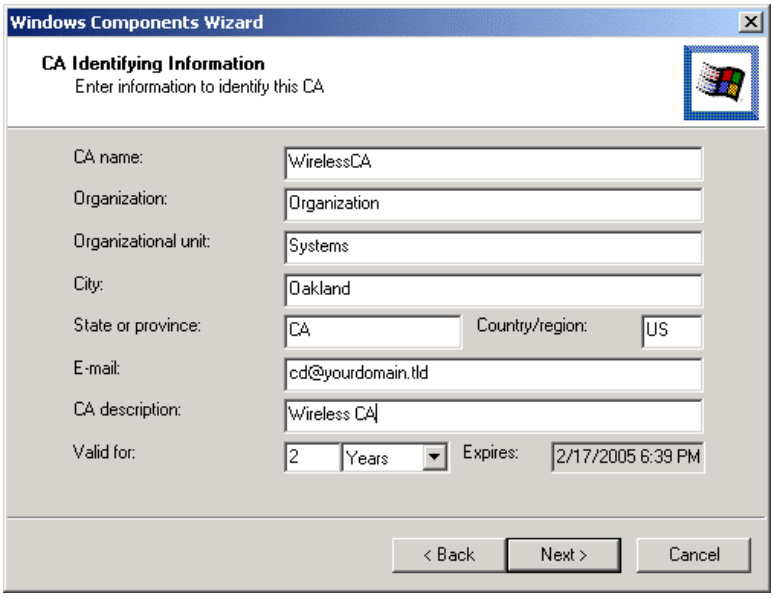


Figure 55: CA Screen

7. Click **Next** if you don't want to change the CA's configuration data.
8. Installation will warn you that Internet Information Services are running, and must be stopped before continuing. Click **OK**, then **Finish**.

DHCP Server Configuration

1. Click on *Start* > *Programs* > *Administrative Tools* > *DHCP*
2. Right-click on the server entry, and select *New Scope*.

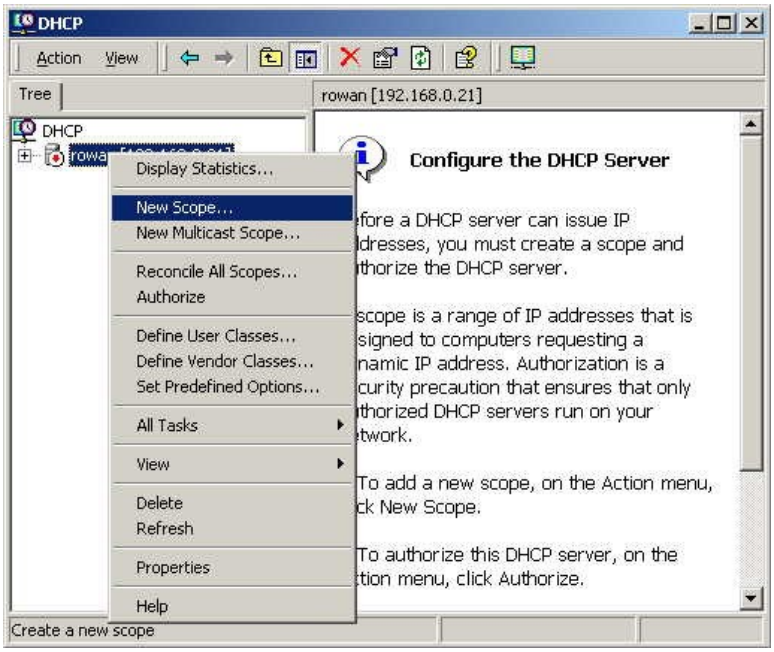


Figure 56: DHCP Screen

3. Click **Next** when the New Scope Wizard begins.
4. Enter the name and description for the scope, click **Next**.
5. Define the IP address range. Change the subnet mask if necessary. Click **Next**.

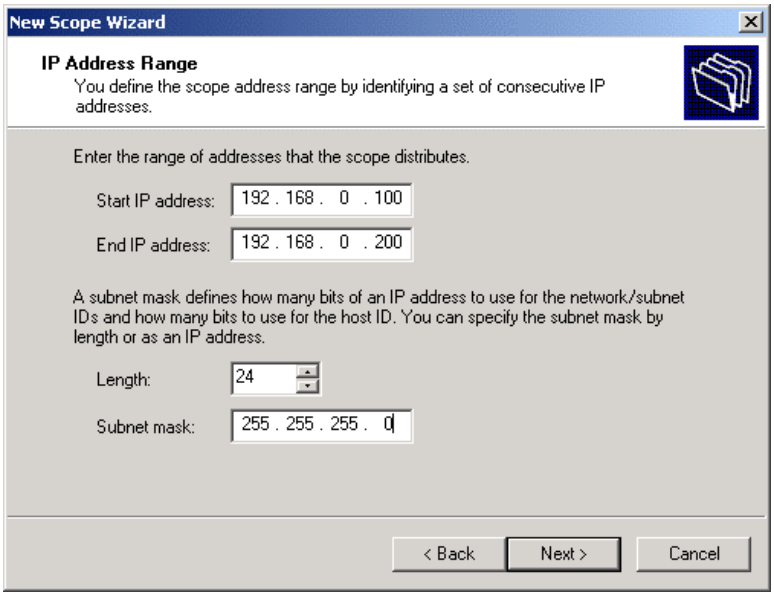


Figure 57: IP Address Screen

6. Add exclusions in the address fields if required. If no exclusions are required, leave it blank. Click **Next**.
7. Change the *Lease Duration* time if preferred. Click **Next**.
8. Select *Yes, I want to configure these options now*, and click **Next**.
9. Enter the router address for the current subnet. The router address may be left blank if there is no router. Click **Next**.
10. For the parent domain, enter the domain you specified for the domain controller setup, and enter the server's address for the IP address. Click **Next**.

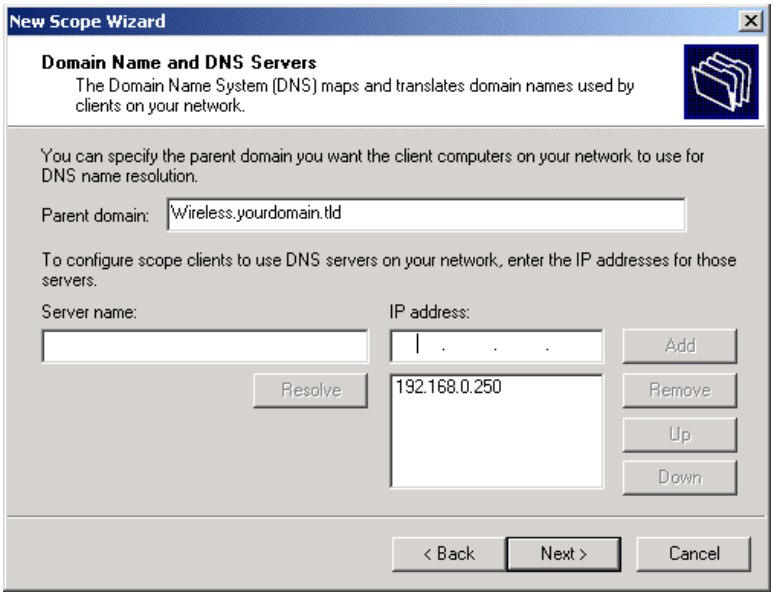


Figure 58: DNS Screen

11. If you don't want a WINS server, just click **Next**.
12. Select *Yes, I want to activate this scope now*. Click **Next**, then **Finish**.
13. Right-click on the server, and select *Authorize*. It may take a few minutes to complete.

Certificate Authority Setup

1. Select *Start* > *Programs* > *Administrative Tools* > *Certification Authority*.
2. Right-click *Policy Settings*, and select *New* > *Certificate to Issue*.

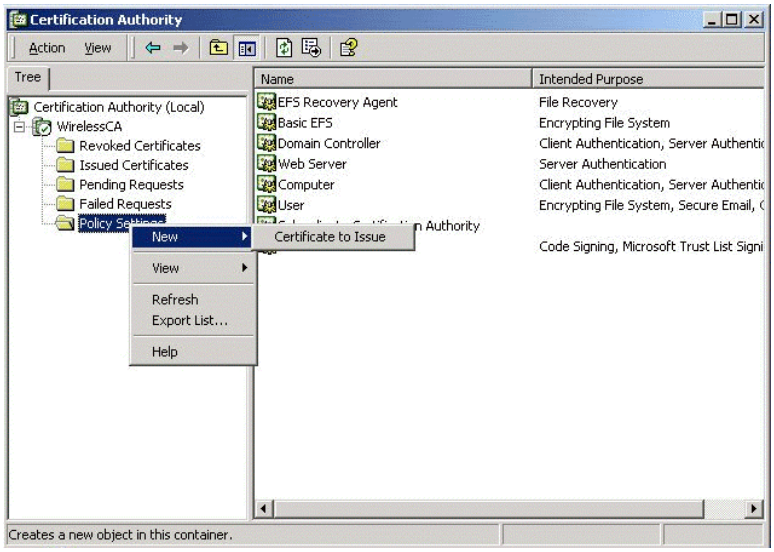


Figure 59: Certificate Authority Screen

3. Select *Authenticated Session* and *Smartcard Logon* (select more than one by holding down the Ctrl key). Click **OK**.

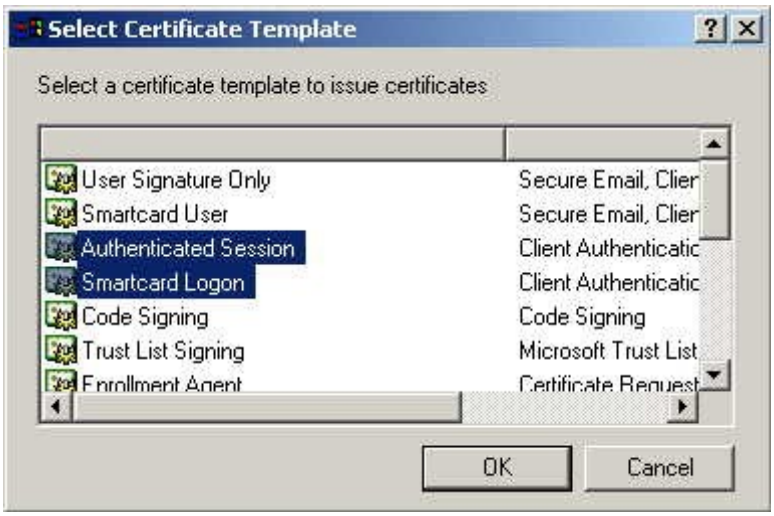


Figure 60: Template Screen

4. Select *Start* > *Programs* > *Administrative Tools* > *Active Directory Users and Computers*.
5. Right-click on your active directory domain, and select *Properties*.

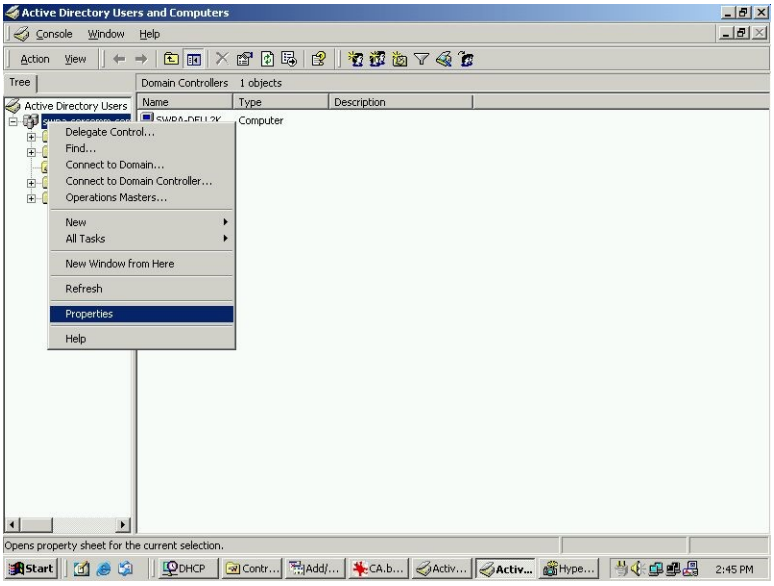


Figure 61: Active Directory Screen

6. Select the *Group Policy* tab, choose *Default Domain Policy* then click **Edit**.

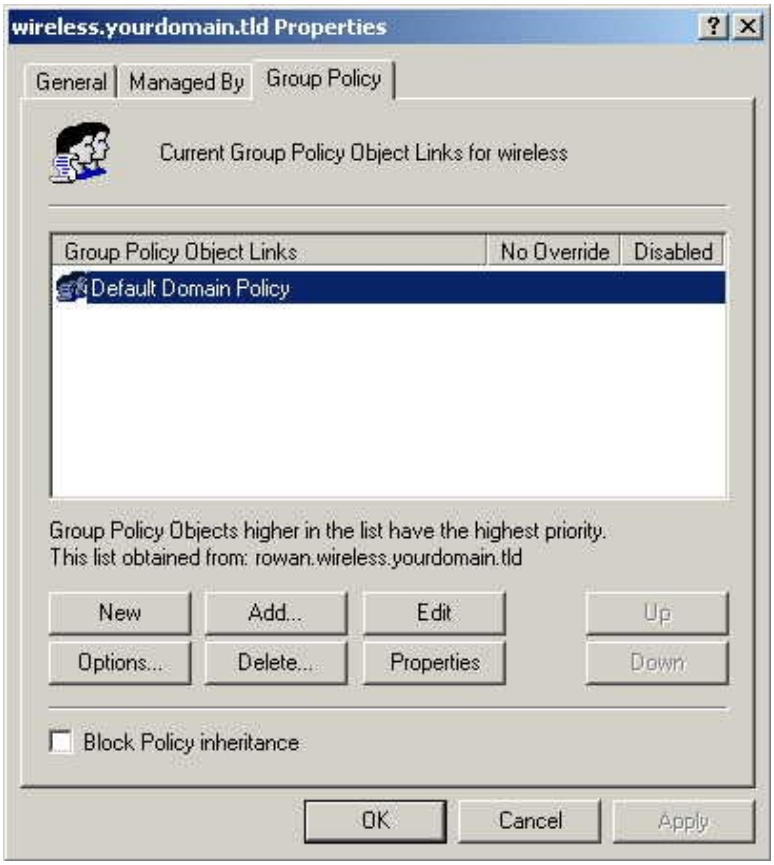


Figure 62: Group Policy Tab

7. Select *Computer Configuration* > *Windows Settings* > *Security Settings* > *Public Key Policies*, right-click Automatic Certificate Request Settings > New > Automatic Certificate Request.

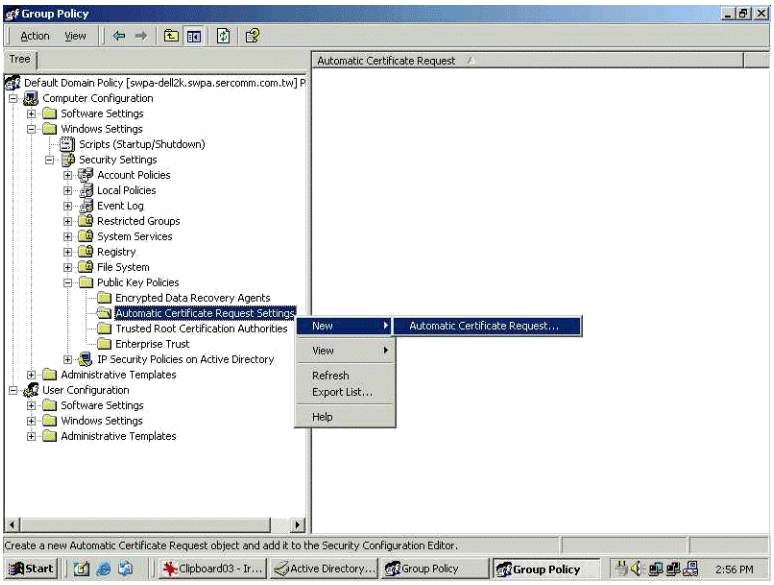


Figure 63: Group Policy Screen

8. When the Certificate Request Wizard appears, click **Next**.
9. Select *Computer*, click **Next**.

Figure 64: Certificate Template Screen

10. Ensure that your Certificate Authority is checked, click *Next*.
11. Review the policy change information and click *Finish*.
12. Click *Start* > *Run*, type "cmd" and press Enter.
    Enter "*secedit /refreshpolicy machine_policy*" (This command may take a few minutes to take effect.

Internet Authentication Service (RADIUS) Setup

1. Select *Start* > *Programs* > *Administrative Tools* > *Internet Authentication Service*.
2. Right-click on *Clients*, and select *New Client*.

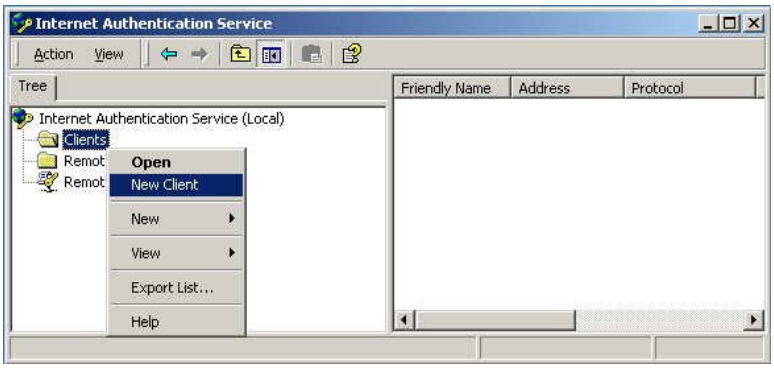


Figure 65: Service Screen

3. Enter a name for the access point, click **Next**.
4. Enter the address or name of the wireless access point, and set the shared secret, as entered on the *Security Settings* of the wireless access point.
5. Click **Finish**.
6. Right-click on *Remote Access Policies*, select *New Remote Access Policy*.
7. Assuming you are using EAP-TLS, name the policy "eap-tls", and click **Next**.

8. Click **Add...**
   If you don't want to set any restrictions and a condition is required, select *Day-And-Time-Restrictions*, and click **Add...**

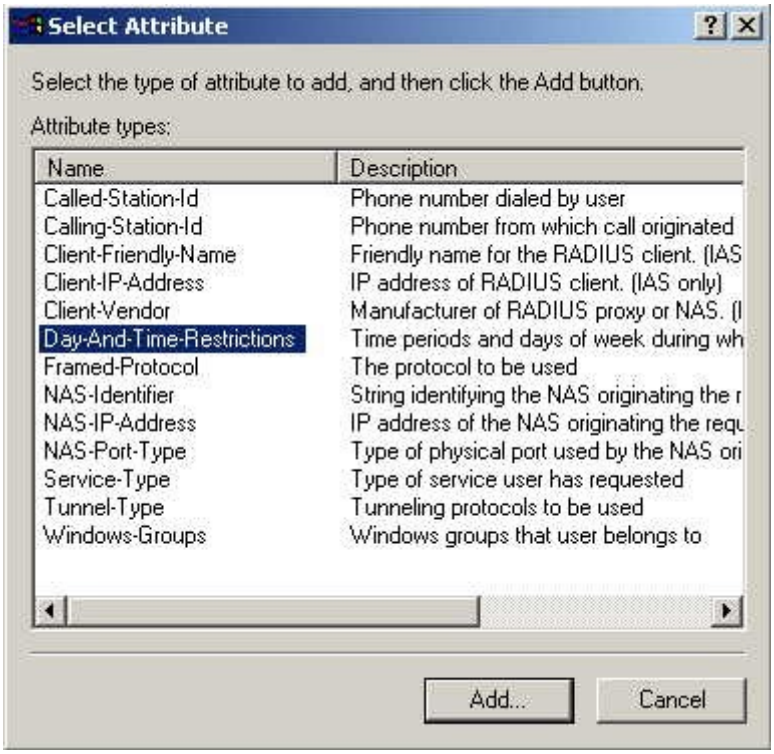


Figure 66: Attribute Screen

9. Click *Permitted*, then **OK**. Select *Next*.
10. Select *Grant remote access permission*. Click **Next**.

11. Click *Edit Profile...* and select the *Authentication* tab. Enable *Extensible Authentication Protocol*, and select *Smart Card or other Certificate*. Deselect other authentication methods listed. Click **OK**.

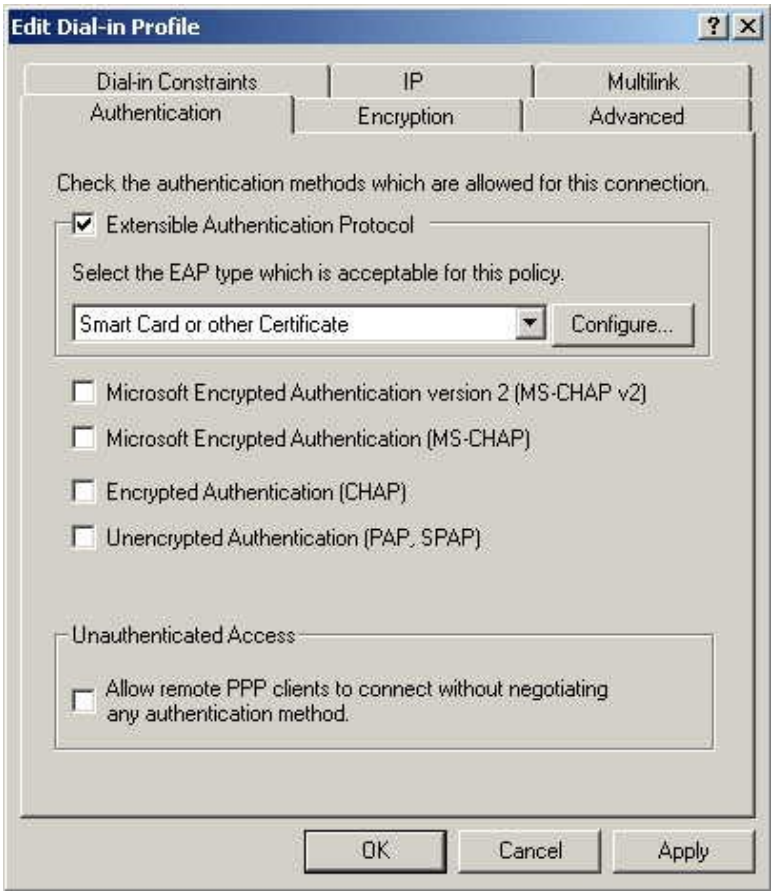


Figure 67: Authentication Screen

12. Select *No* if you don't want to view the help for EAP. Click **Finish**.

Remote Access Login for Users

1. Select Start > Programs > Administrative Tools > Active Directory Users and Computers.
2. Double click on the user who you want to enable.

3. Select the Dial-in tab, and enable Allow access. Click OK.

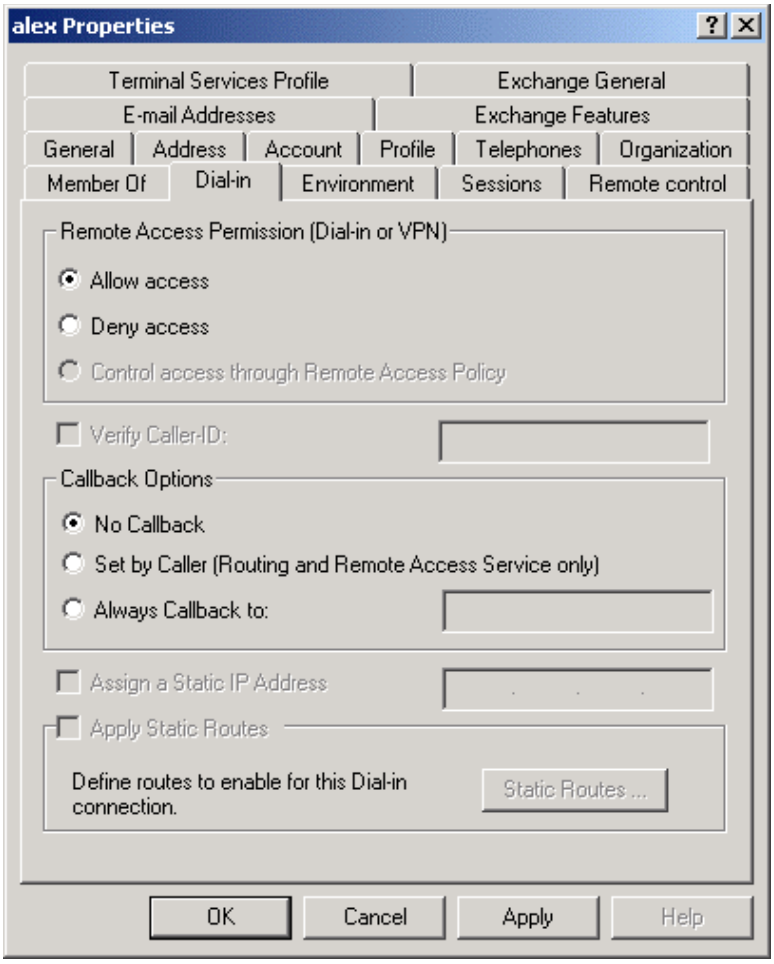


Figure 68: Dial-in Screen

802.1x Client Setup on Windows XP

Windows XP ships with a complete 802.1x client implementation. If using Windows 2000, you can install SP3 (Service Pack 3) to gain the same functionality.

If you don't have either of these systems, you must use the 802.1x client software provided with your wireless adapter. Refer to your vendor's documentation for setup instructions.

The following instructions assume that:

- You are using Windows XP
- You are connecting to a Windows 2000 server for authentication.
- You already have a login (User-name and password) on the Windows 2000 server.

Client Certificate Setup

1. Connect to a network that doesn't require port authentication.
2. Start your Web browser. In the *Address* box, enter the IP address of the Windows 2000 Server, followed by "/certsrv". Example: http://192.168.0.2/certsrv
3. You will be prompted for a user name and password. Enter the *User name* and *Password* assigned to you by your network administrator, and click **OK**.

Figure 69: Connect Screen

4. On the first screen (below), select *Request a certificate*, click **Next**.

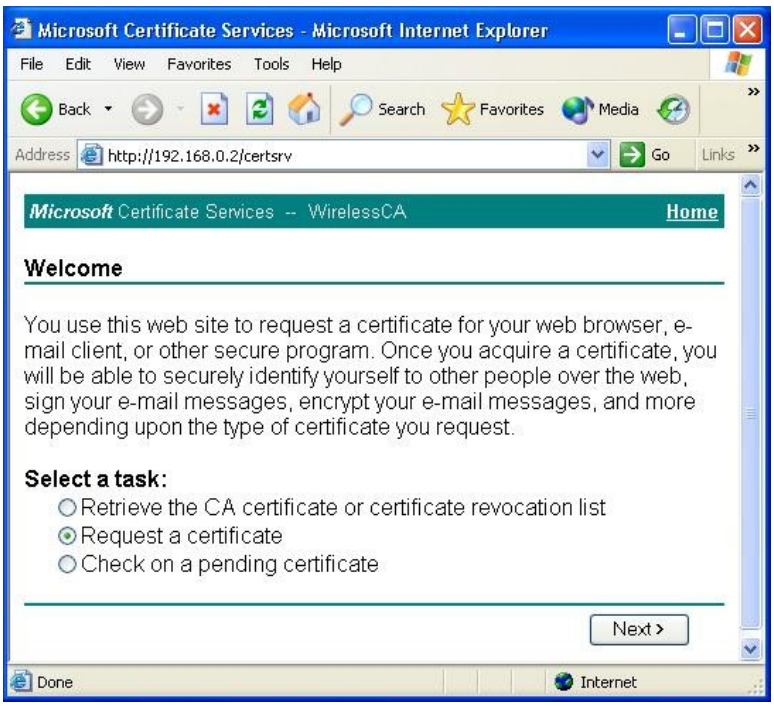


Figure 70: Wireless CA Screen

5. Select *User certificate request* and select *User Certificate*, click **Next**.

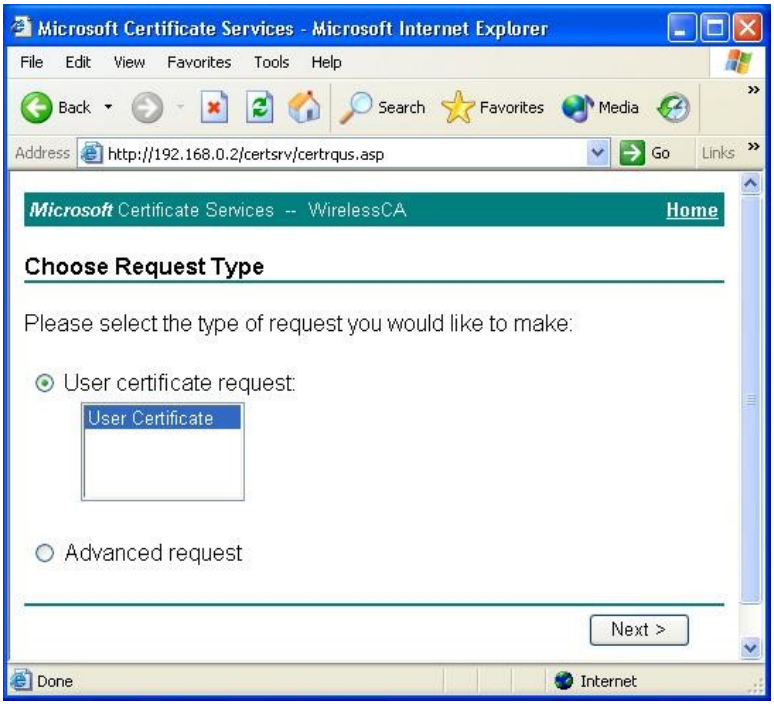


Figure 71: Request Type Screen

6. Click **Submit**.

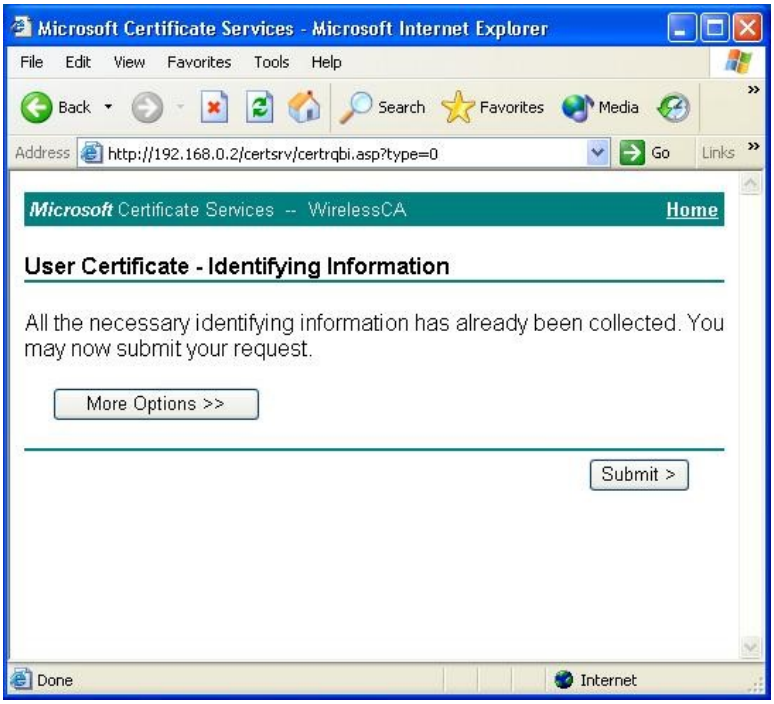


Figure 72: Identifying Information Screen

7. A message will be displayed and the certificate will be returned to you. Click *Install this certificate*.

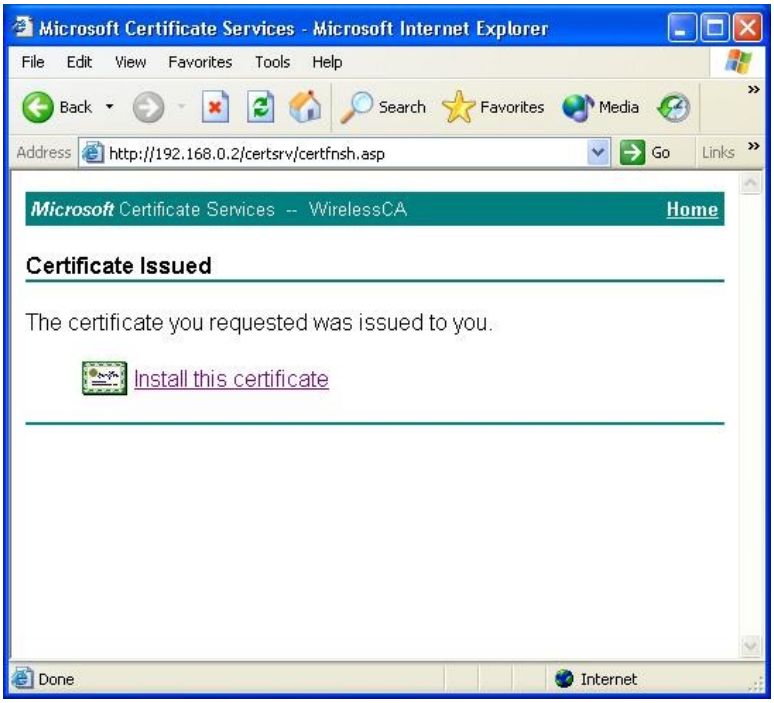


Figure 73: Certificate Issued Screen

8. You will receive a confirmation message. Click **Yes**.

Figure 74: Root Certificate Screen

9. Certificate setup is now complete.

802.1x Authentication Setup

1. Open the properties for the wireless connection, by selecting *Start > Control Panel > Network Connections.*
2. Right-click on the *Wireless Network Connection*, and select *Properties*.
3. Select the *Authentication* Tab, and ensure that *Enable network access control using IEEE 802.1X* is selected, and *Smart Card or other Certificate* is selected from the EAP type.

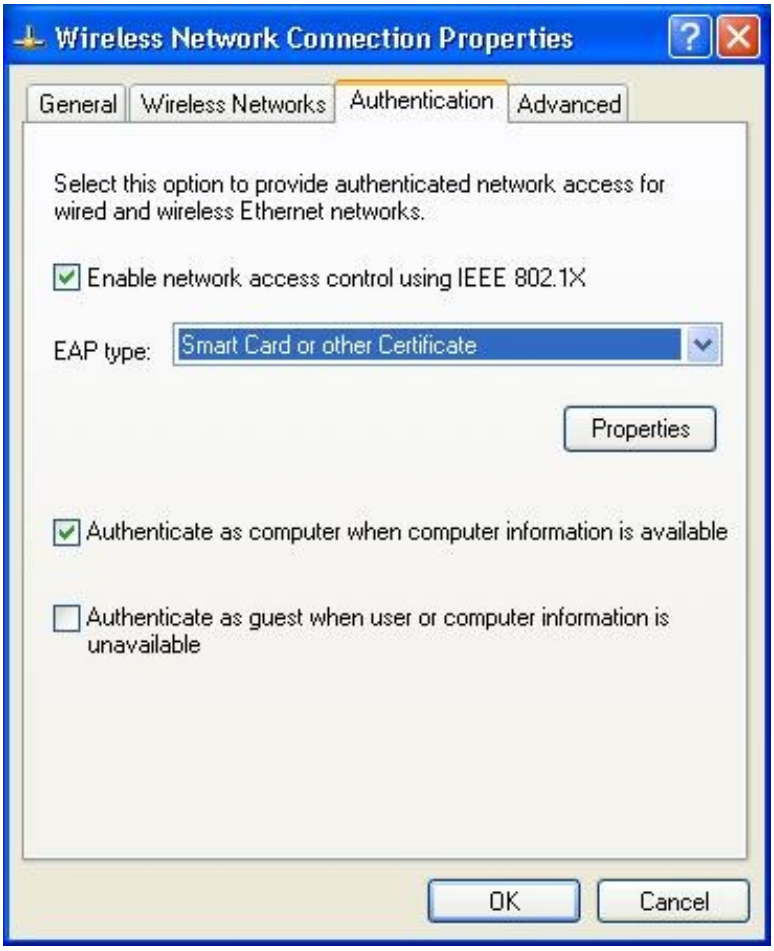


Figure 75: Authentication Tab

Encryption Settings

The encryption settings must match the access point's on the wireless network you wish to join.

- Windows XP will detect any available wireless networks, and allow you to configure each network independently.
- Your network administrator can advise you of the correct settings for each network. 802.1x networks typically use EAP-TLS. This is a dynamic key system, so there is no need to enter key values.

Enabling Encryption

To enable encryption for a wireless network, follow this procedure.

1. Click on the *Wireless Networks* tab.

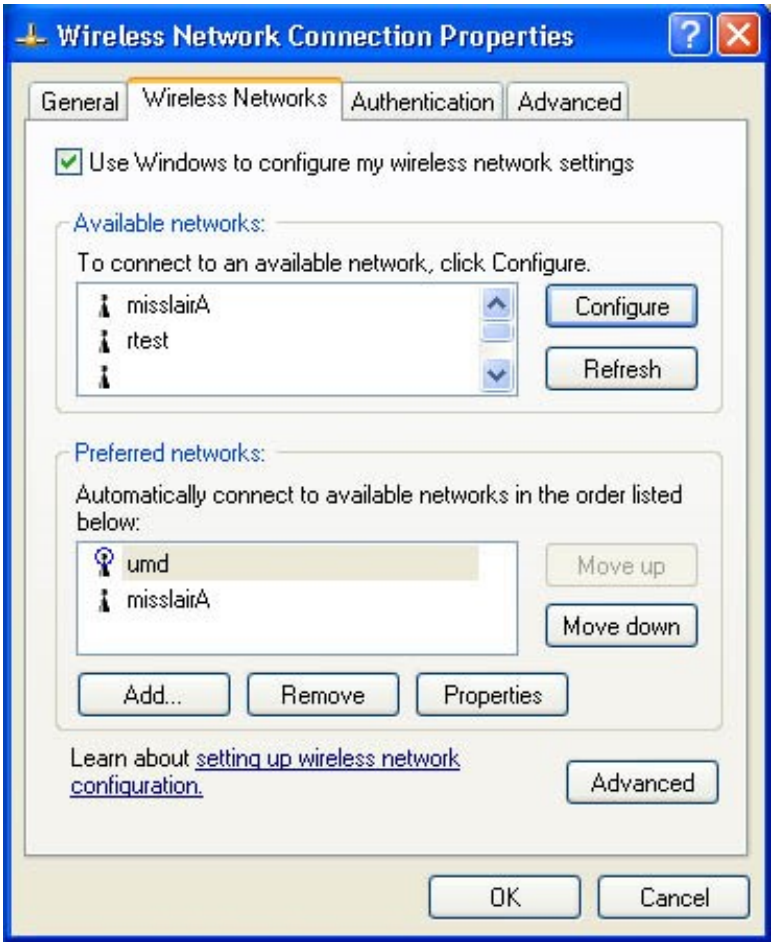


Figure 76: Wireless Networks Screen

2. Select the wireless network from the *Available Networks* list, and click *Configure*.

3. Select and enter the correct values, as advised by your Network Administrator.
   For example, to use EAP-TLS, you would enable *Data encryption*, and click the checkbox for the setting *The key is provided for me automatically*, as shown below.

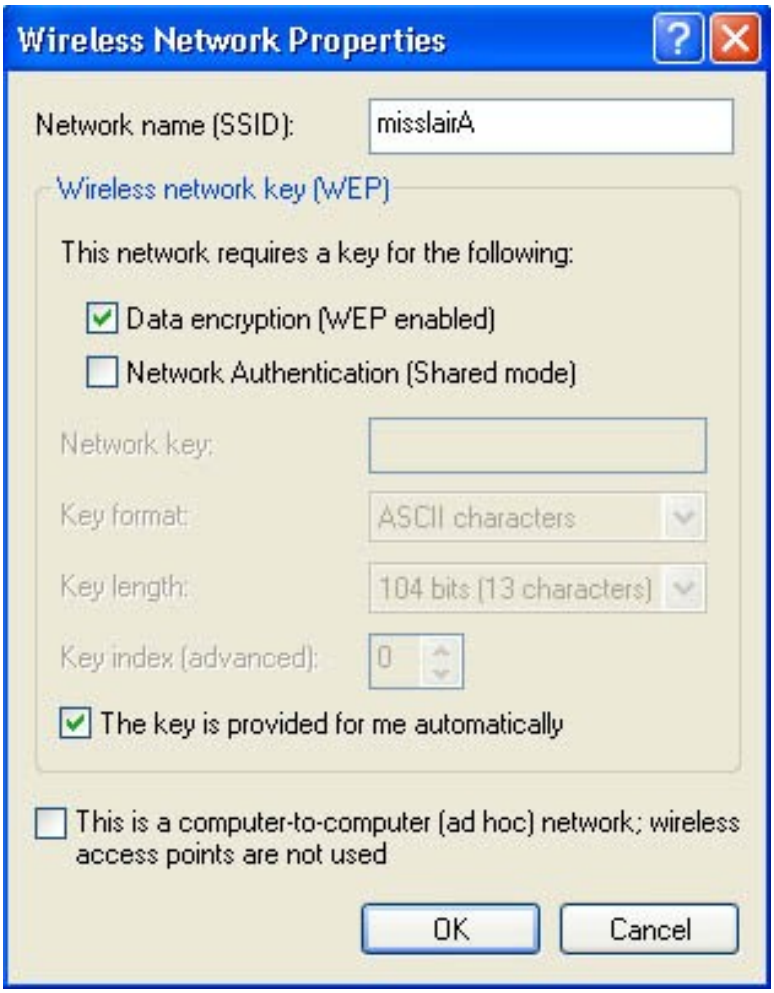


Figure 77: Properties Screen

Setup for Windows XP and 802.1x client is now complete.

Using 802.1x Mode (without WPA)

This is very similar to using WPA-Enterprise.

The only difference is that on your client, you must NOT enable the setting *The key is provided for me automatically*.

Instead, you must enter the WEP key manually, ensuring it matches the WEP key used on the access point.

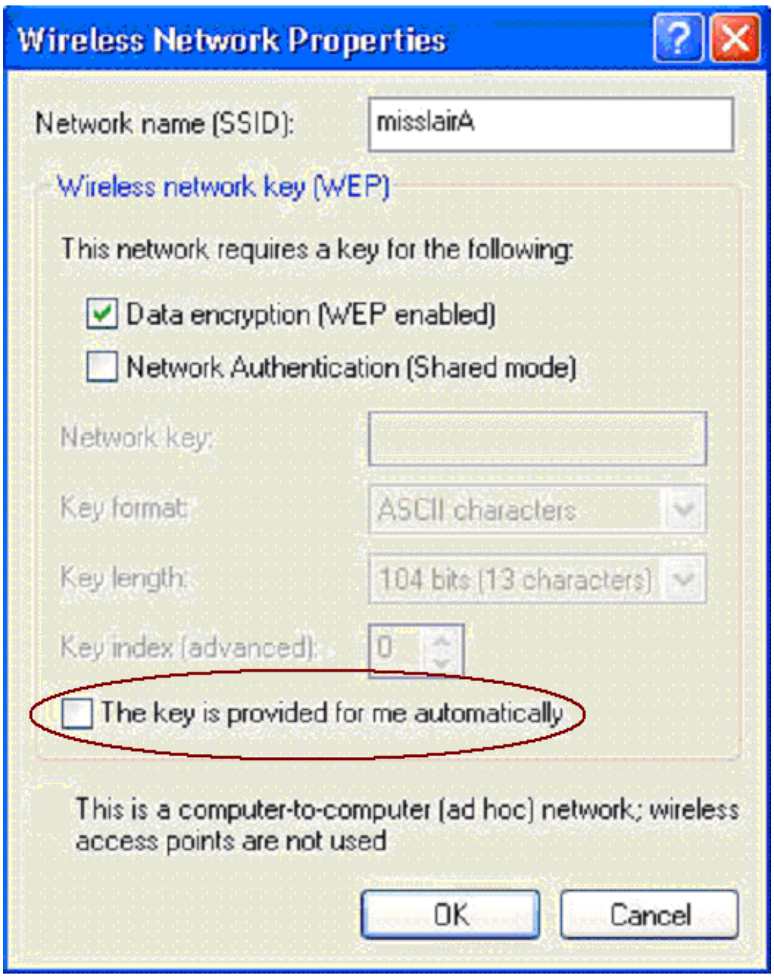


Figure 78: Properties Screen

Note—*On some systems, the 64-bit WEP key is shown as 40-bit and the 128-bit WEP key is shown as 104-bit. This difference arises because the key input by the user is 24 bits less than the key size used for encryption.*

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