LAPAC1200

AC1200 Dual Band Access Point

User's Guide

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Document Version: 1.0

Chapter 1

Quick Start Guide

Package Contents

- Linksys Wireless Access Point
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- Ethernet Cable
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Physical Details

There is one LED for the device.

LED

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.

Port 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. LAPAC1750 is powered on from an 802.3at compliance source.

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

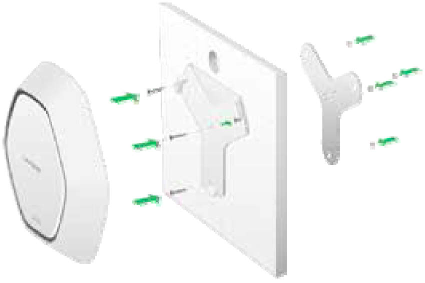
To avoid overheating, do not install your access point if ambient temperatures exceed 104°F (40°C). Install on a flat, stable surface, near the center of your wireless coverage area making sure not to block vents on the sides of the device enclosure.

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

2

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.

Setup 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

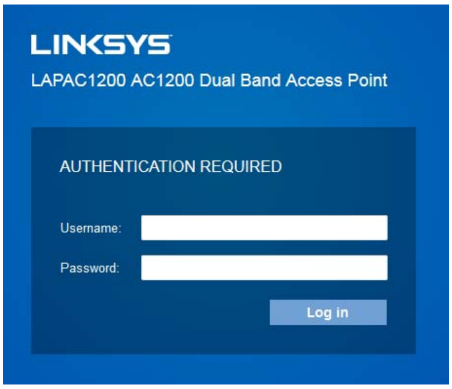
Setup Procedure

Before starting setup, install the wireless access point on your LAN, as described earlier.

1. Locate the wireless access point's default name on a label on the base or rear. The default name will be lapxxxxx, where xxxxx is a set of the last 5 characters of your access point MAC address. MAC address is available on the brown box label or product label.
2. Use a PC connected to your LAN, either by a wired connection or another access point. Until the wireless access point is configured, establishing a wireless connection to it may be not possible.
   If your LAN contains a router or routers, ensure the PC used for configuration is on the same LAN segment as the wireless access point.
3. Start your Web browser.
4. Enter the IP address of the wireless access point, as in this example, which uses the wireless access point's default IP address:

   ```
   http://192.168.1.252
   ```

   At the login prompt, enter **`admin`** for the *User name*, and **`admin`** for the *Password*. These are the default values. You should change the password.



LINKSYS

LAPAC1200 AC1200 Dual Band Access Point

AUTHENTICATION REQUIRED

Username:

Password:

Figure 1: Password Dialog

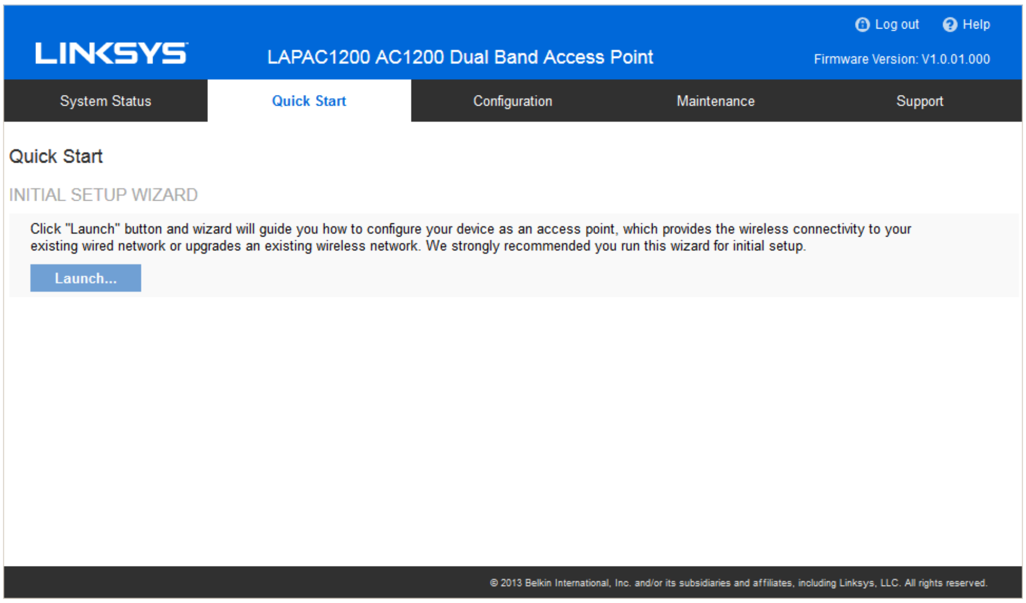
5. From the *status* screen menu configure for your environment. Details of these screens and settings are described in the following sections of this chapter.
6. You may also wish to change the admin password on the *User Accounts* screen, accessed from the **Configuration** menu.
7. Wireless stations must now be set to match the wireless access point. See Chapter 4 for details.

> **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. The default IP address of the wireless access point is 192.168.1.252, with a network mask of 255.255.255.0.
>
> 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 - Troubleshooting*** 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*** link on the main menu



Quick Start

INITIAL SETUP WIZARD

Click "Launch" button and wizard will guide you how to configure your device as an access point, which provides the wireless connectivity to your existing wired network or upgrades an existing wireless network. We strongly recommended you run this wizard for initial setup.

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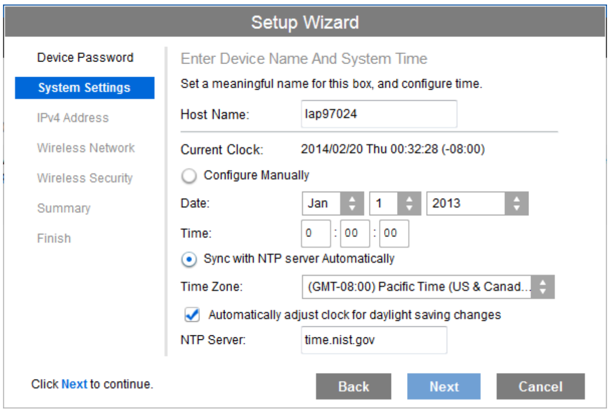
Figure 2: Setup Wizard

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.



Enter Device Name And System Time

Set a meaningful name for this box, and configure time.

Host Name: lap97024

Current Clock: 2014/02/20 Thu 00:32:28 (-08:00)

○ Configure Manually

Date: Jan 1 2013

Time: 0 : 00 : 00

● Sync with NTP server Automatically

Time Zone: (GMT-08:00) Pacific Time (US & Canad...

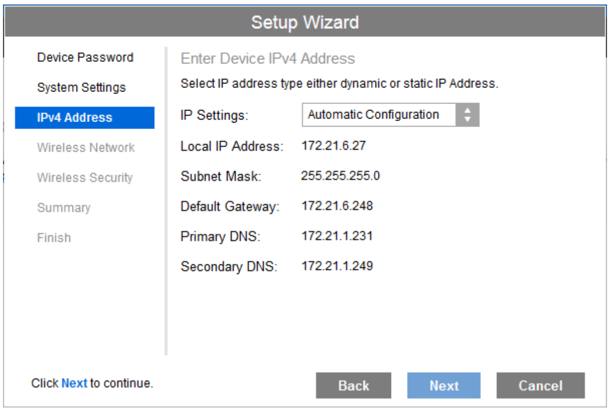
☑ Automatically adjust clock for daylight saving changes

NTP Server: time.nist.gov

Click Next to continue.

Figure 3: Setup Wizard - System Settings

5. On the *IPv4 Address* screen (Figure 6) configure the IP address of the device then click Next. If you want to configure more than 4 SSIDs, please go to Configuration->Wireless ->Basic Settings. The access point supports up to 8 SSIDs per radio.



Enter Device IPv4 Address

Select IP address type either dynamic or static IP Address.

IP Settings: Automatic Configuration

Local IP Address: 172.21.6.27

Subnet Mask: 255.255.255.0

Default Gateway: 172.21.6.248

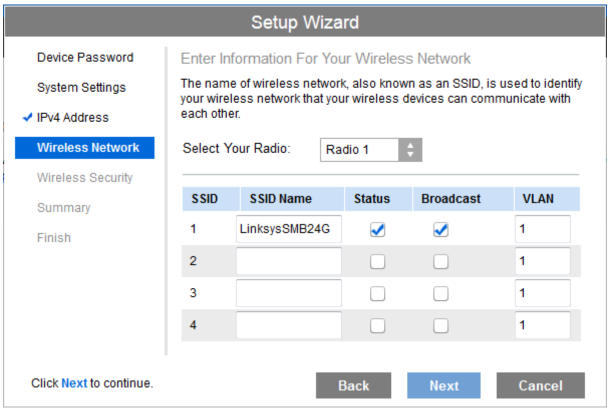
Primary DNS: 172.21.1.231

Secondary DNS: 172.21.1.249

Click Next to continue.

Figure 4: Setup Wizard - IPv4

6. Set the SSID information on the *Wireless Network* screen. Click Next.



Enter Information For Your Wireless Network

The name of wireless network, also known as an SSID, is used to identify your wireless network that your wireless devices can communicate with each other.

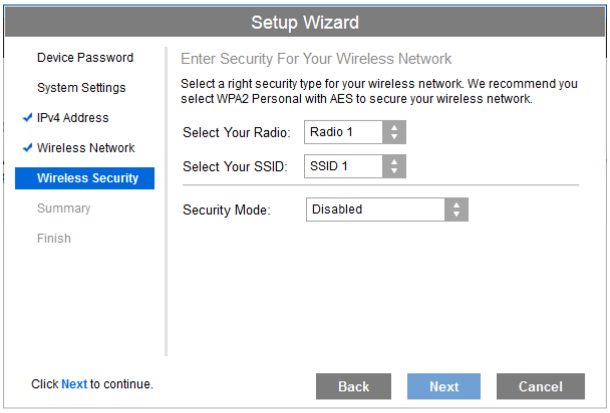
Select Your Radio: Radio 1

SSID	SSID Name	Status	Broadcast	VLAN
1	LinksysSMB24G	☑	☑	1
2		□	□	1
3		□	□	1
4		□	□	1

Click Next to continue.

Figure 5: Setup Wizard - Wireless Network

7. On the *Wireless Security* Screen (Figure 8) 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.



Enter Security For Your Wireless Network

Select a right security type for your wireless network. We recommend you select WPA2 Personal with AES to secure your wireless network.

Select Your Radio: Radio 1

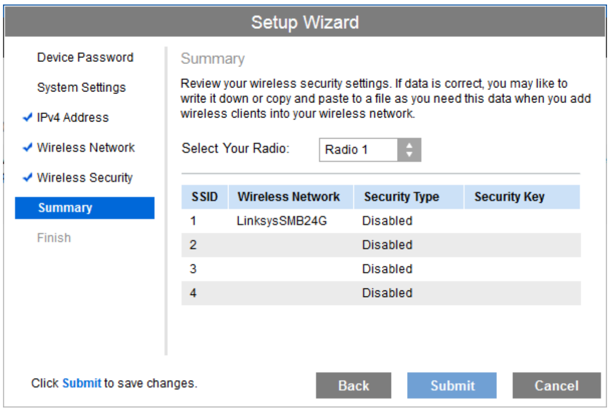
Select Your SSID: SSID 1

Security Mode: Disabled

Click Next to continue.

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.



Summary

Review your wireless security settings. If data is correct, you may like to write it down or copy and paste to a file as you need this data when you add wireless clients into your wireless network.

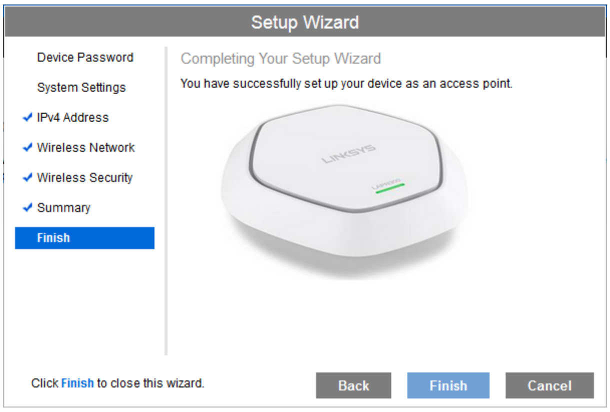
Select Your Radio: Radio 1

SSID	Wireless Network	Security Type	Security Key
1	LinksysSMB24G	Disabled	
2		Disabled	
3		Disabled	
4		Disabled	

Click Submit to save changes.

Figure 7: Setup Wizard - Summary

9. Click Finish to leave the wizard.



Completing Your Setup Wizard

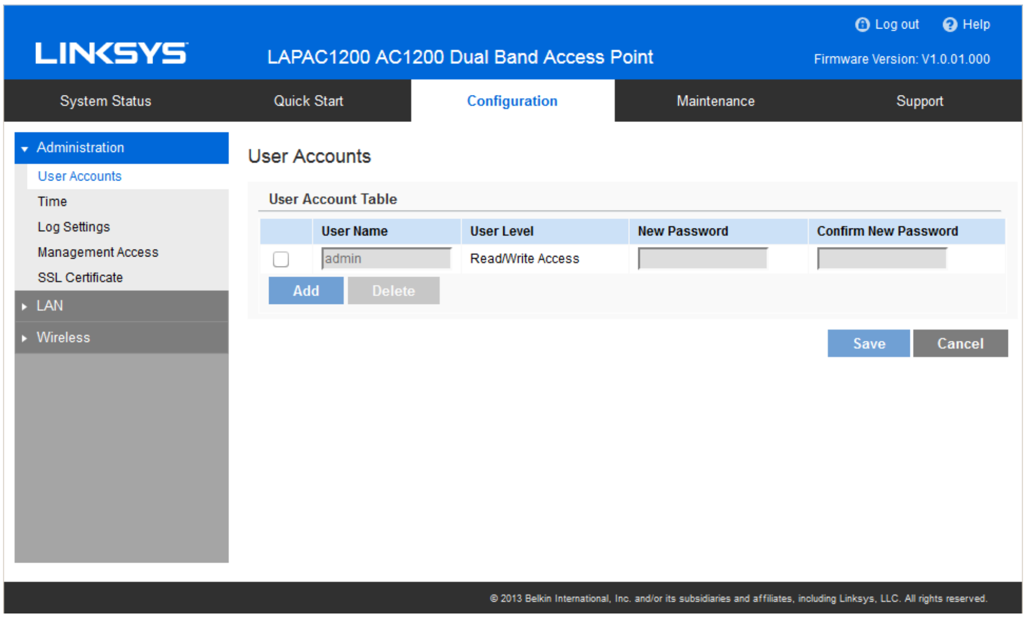
You have successfully set up your device as an access point.

Click Finish to close this wizard.

Figure 8: Setup Wizard - Finish

User Accounts

Click *User Accounts* on the Administration menu to manage user accounts. The access point supports up to 5 users: one administrator and four normal users.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Administration
User Accounts
Time
Log Settings
Management Access
SSL Certificate
LAN
Wireless
Add
Delete
Save
Cancel
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User Accounts

User Account Table

	User Name	User Level	New Password	Confirm New Password
□	admin	Read/Write Access		

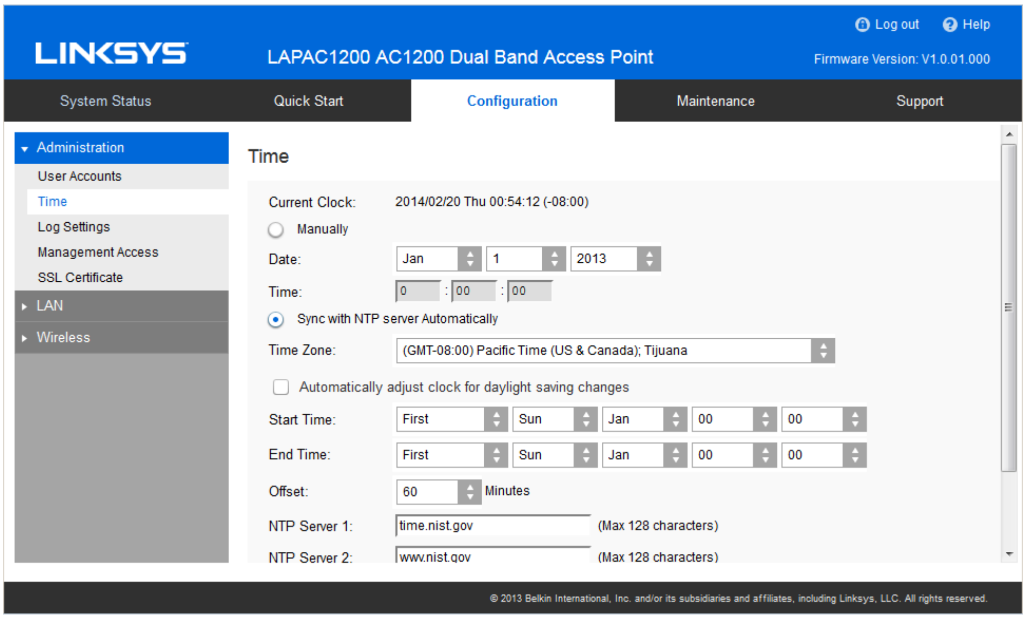
Figure 9: User Accounts

Data - 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 Screen

Click *Time* on the Administration menu to configure system time of the device.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Administration
User Accounts
Time
Log Settings
Management Access
SSL Certificate
LAN
Wireless
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Time

Current Clock: 2014/02/20 Thu 00:54:12 (-08:00)

○ Manually

Date: Jan | 1 | 2013

Time: 0 : 00 : 00

● Sync with NTP server Automatically

Time Zone: (GMT-08:00) Pacific Time (US & Canada); Tijuana

□ Automatically adjust clock for daylight saving changes

Start Time: First | Sun | Jan | 00 | 00

End Time: First | Sun | Jan | 00 | 00

Offset: 60 Minutes

NTP Server 1: time.nist.gov (Max 128 characters)

NTP Server 2: www.nist.gov (Max 128 characters)

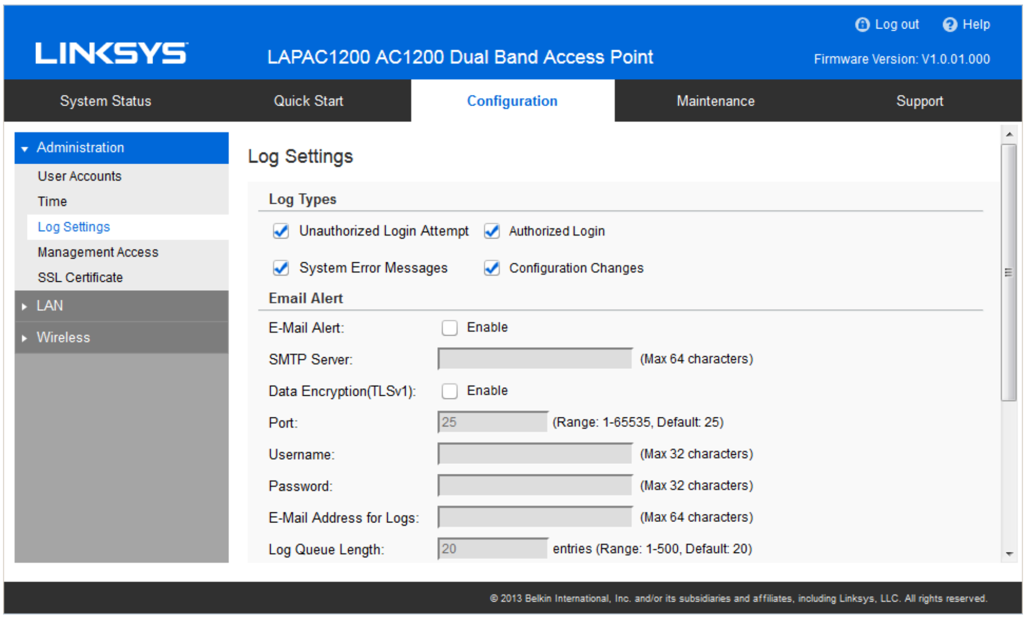
Figure 10: Time Screen

Data - 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 Screen

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



Log Settings

Log Types

☑ Unauthorized Login Attempt ☑ Authorized Login

☑ System Error Messages ☑ Configuration Changes

Email Alert

E-Mail Alert:	□ Enable	
SMTP Server:		(Max 64 characters)
Data Encryption(TLSv1):	□ Enable	
Port:	25	(Range: 1-65535, Default: 25)
Username:		(Max 32 characters)
Password:		(Max 32 characters)
E-Mail Address for Logs:		(Max 64 characters)
Log Queue Length:	20	entries (Range: 1-500, Default: 20)

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Figure 11: Log Settings Screen

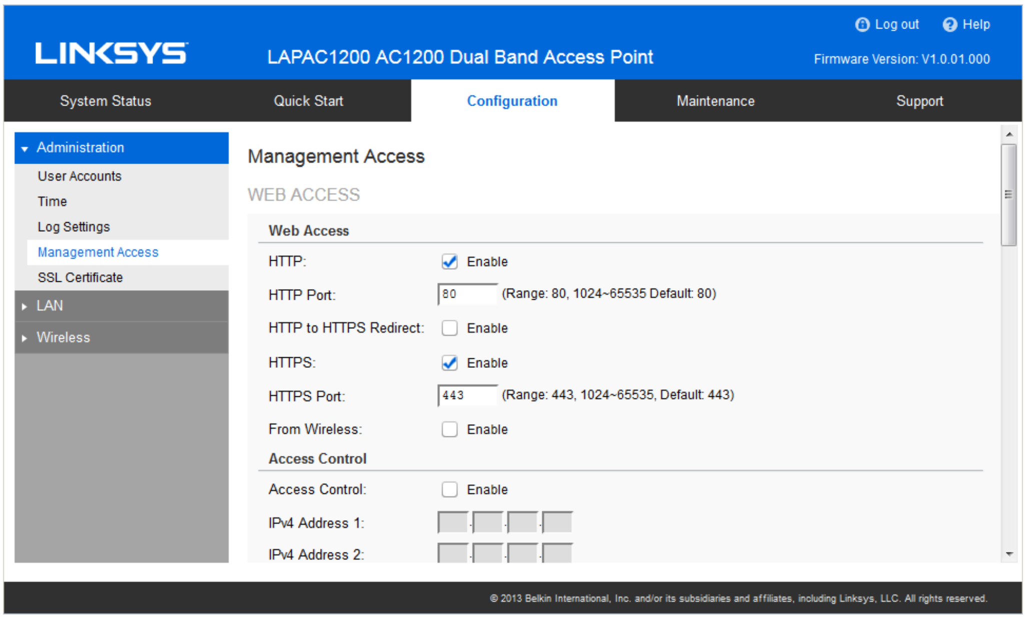
Data - Logs Screen

Log Types	
Log Types	Select events to log. Checking all options increase 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 e-mail 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 login to your SMTP server. The Username can include up to 32 characters. Special characters are allowed.
Password	Enter the Password to login 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 IPv60029.
Server IP Address	Enter the IPv4 or IPv6 address of syslog server here.

Management Access Screen

You can use the Management page to configure the management methods of the access point.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Administration
User Accounts
Time
Log Settings
Management Access
SSL Certificate
LAN
Wireless
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Management Access

WEB ACCESS

Web Access

HTTP:	☑ Enable
HTTP Port:	80 (Range: 80, 1024~65535 Default: 80)
HTTP to HTTPS Redirect:	□ Enable
HTTPS:	☑ Enable
HTTPS Port:	443 (Range: 443, 1024~65535, Default: 443)
From Wireless:	□ Enable

Access Control

Access Control:	□ Enable
IPv4 Address 1:	. . .
IPv4 Address 2:	. . .

Figure 12: Management Access Screen

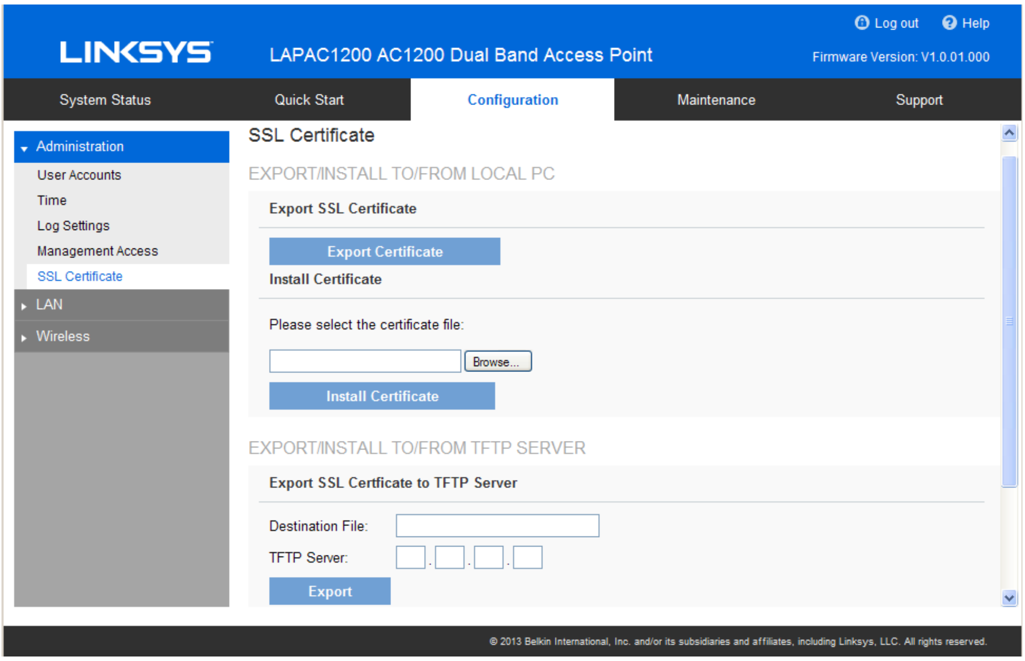
Data - Management Access Screen

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.
SNMP v1/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.
SNMP v3 Settings	
SNMP v3 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 Screen

This screen can be used to manage SSL certificate used by HTTPS.



SSL Certificate

EXPORT/INSTALL TO/FROM LOCAL PC

Export SSL Certificate

Install Certificate

Please select the certificate file:

EXPORT/INSTALL TO/FROM TFTP SERVER

Export SSL Certficate to TFTP Server

Destination File:

TFTP Server: . . .

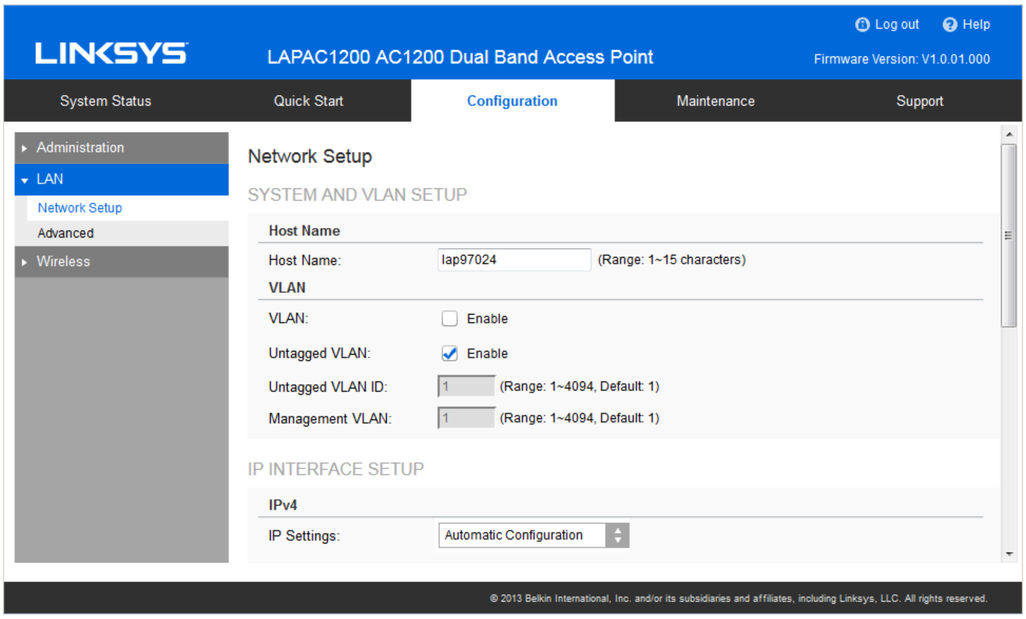
Figure 13: SSL Certificate Screen

Data - 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 IP address for the TFTP server. Only support IPv4 address here.
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 IP address for the TFTP server. Only support IPv4 address here.
Install	Click to install the file to the device.

Network Setup Screen

Use this screen to configure basic device settings, VLAN settings and settings for the LAN interface, including static or dynamic IPv4/IPv6 address assignment.



Network Setup

SYSTEM AND VLAN SETUP

Host Name

Host Name: lap97024 (Range: 1~15 characters)

VLAN

VLAN: □ Enable

Untagged VLAN: ☑ Enable

Untagged VLAN ID: 1 (Range: 1~4094, Default: 1)

Management VLAN: 1 (Range: 1~4094, Default: 1)

IP INTERFACE SETUP

IPv4

IP Settings: Automatic Configuration

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Figure 14: Network Setup Screen

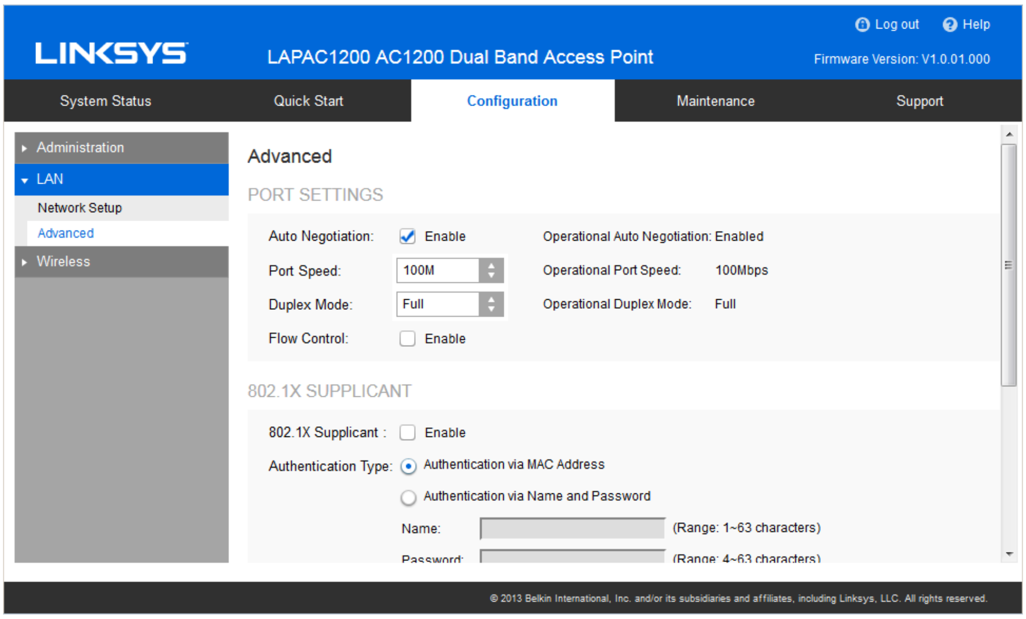
Data - Network Setup Screen

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 -. 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 from the LAN port is untagged when the following conditions are met: 1) VLAN ID is equal to Untagged VLAN ID and 2) 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. All traffic will be untagged until you disable the untagged VLAN, change the untagged traffic VLAN ID, or change the VLAN ID for a SSID.

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 both untagged VLAN and management 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 Screen

Use this screen to configure advanced network settings of the access point.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
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Configuration
Maintenance
Support
Administration
LAN
Network Setup
Advanced
Wireless
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Advanced

PORT SETTINGS

Auto Negotiation: ☑ Enable — Operational Auto Negotiation: Enabled

Port Speed: 100M — Operational Port Speed: 100Mbps

Duplex Mode: Full — Operational Duplex Mode: Full

Flow Control: □ Enable

802.1X SUPPLICANT

802.1X Supplicant : □ Enable

Authentication Type: ● Authentication via MAC Address

○ Authentication via Name and Password

Name: (Range: 1~63 characters)

Password: (Range: 4~63 characters)

Figure 15: Advanced Screen

Data - 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.

Wireless Screens

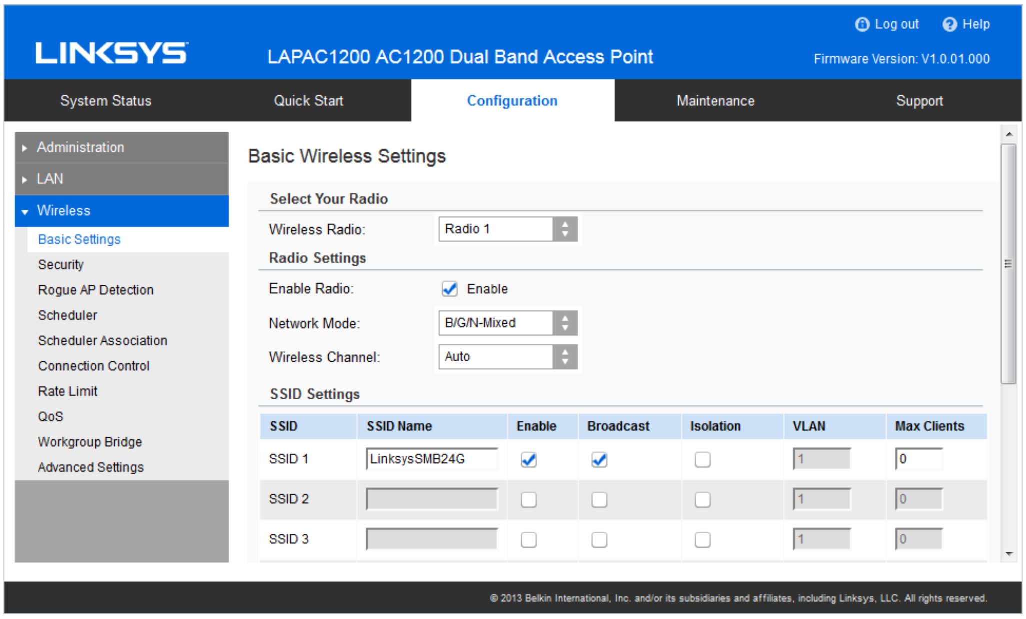
There are ten configuration screens:

- Basic Settings
- Security
- Rogue AP Detection
- Scheduler
- Scheduler Association
- Connection Control
- Rate Limit
- QoS
- Workgroup Bridge
- Advanced Settings

Basic Settings

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

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



Basic Wireless Settings

Select Your Radio

Wireless Radio: Radio 1

Radio Settings

Enable Radio: ☑ Enable

Network Mode: B/G/N-Mixed

Wireless Channel: Auto

SSID Settings

SSID	SSID Name	Enable	Broadcast	Isolation	VLAN	Max Clients
SSID 1	LinksysSMB24G	☑	☑	□	1	0
SSID 2		□	□	□	1	0
SSID 3		□	□	□	1	0

Figure 16: Basic Settings Screen

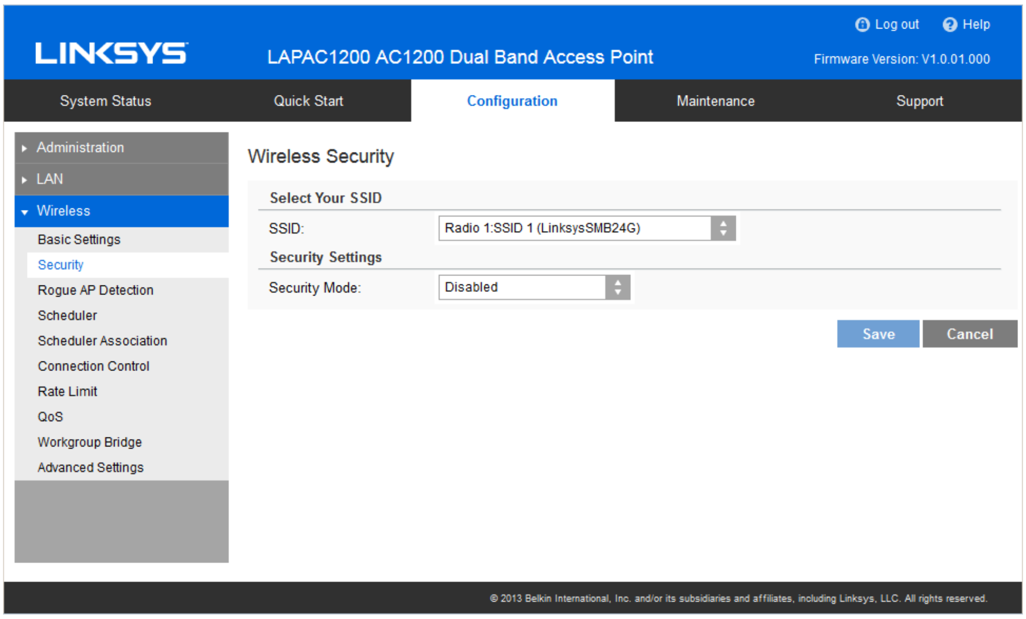
Data - Wireless Basic Settings Screen

Basic Wireless Settings	
Wireless Radio	Select the wireless radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.

Enable Radio	Enable or disable the wireless radio.
Wireless Mode	Select the desired option for radio 1: • **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. Select the desired option for radio 2: ~~• **A only** - allow connection by 802.11A wireless stations only.~~ • **N only** - allow connection by 802.11N wireless stations only. • **~~A/~~N/A-Mixed** - allow connection by 802.11A and N wireless stations only. • **AC only** - allow connection by 802.11AC wireless stations only. • **A/N/AC-Mixed** - allow connection by 802.11A, 802.11N and 802.11AC 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. It’s 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 interface. 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 Settings

Use this screen to configure security settings of SSIDs to provide data protection over the wireless network



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode: Disabled

Figure 17: Security Settings

Data - 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 Settings

- **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. 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.

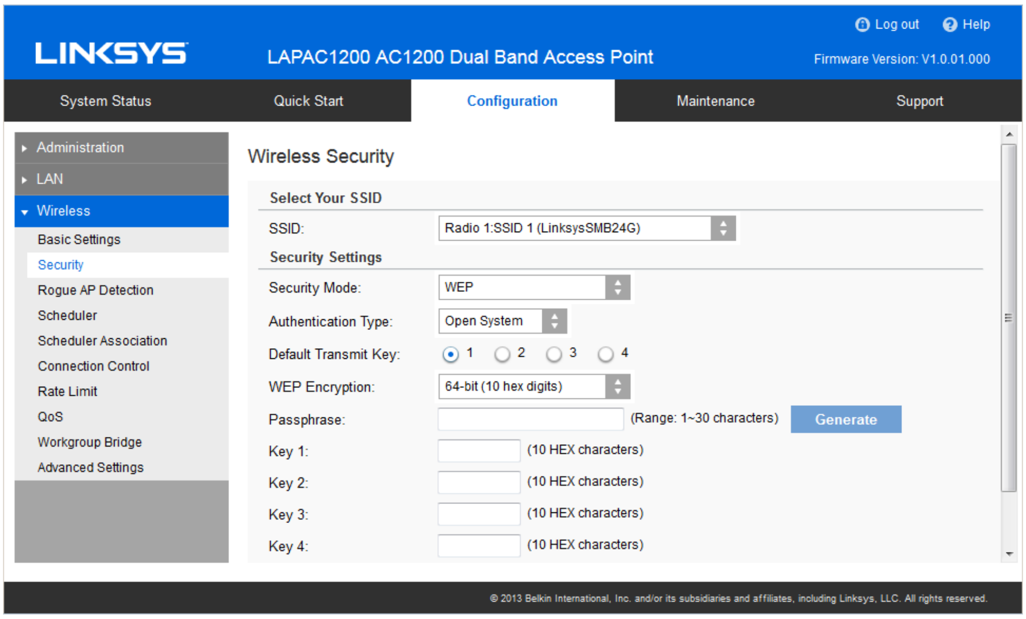
  If this option is selected:

  - 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.
- **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.



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode: WEP

Authentication Type: Open System

Default Transmit Key: ● 1 ○ 2 ○ 3 ○ 4

WEP Encryption: 64-bit (10 hex digits)

Passphrase: (Range: 1~30 characters)

Key 1: (10 HEX characters)

Key 2: (10 HEX characters)

Key 3: (10 HEX characters)

Key 4: (10 HEX characters)

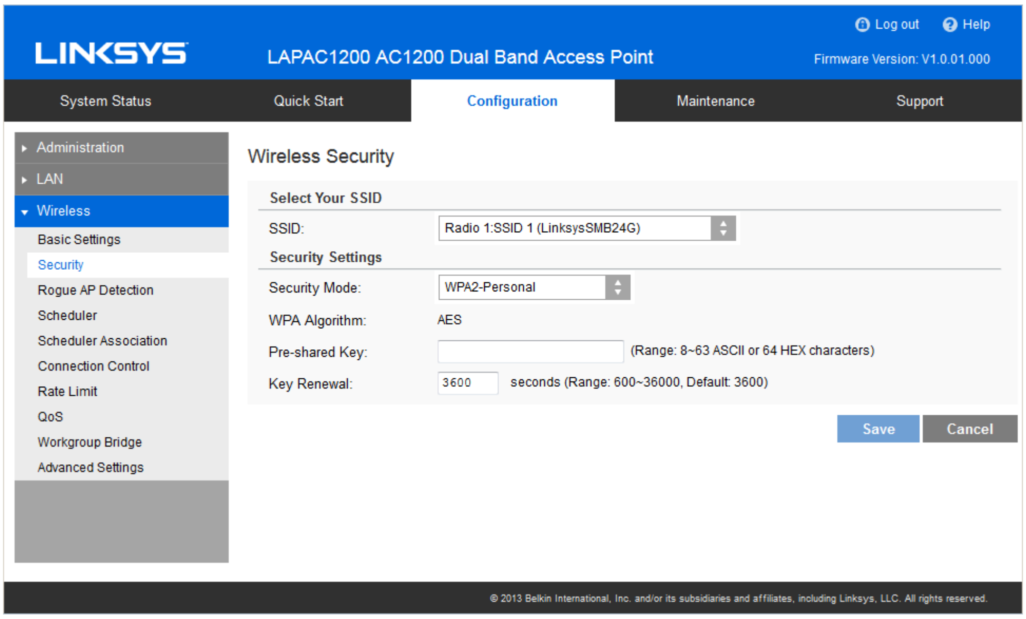
Figure 18: WEP Wireless Security Screen

Data - WEP Screen

WEP	
Authentication	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.

Security Settings - WPA2-Personal

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



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode: WPA2-Personal

WPA Algorithm: AES

Pre-shared Key: (Range: 8~63 ASCII or 64 HEX characters)

Key Renewal: 3600 seconds (Range: 600~36000, Default: 3600)

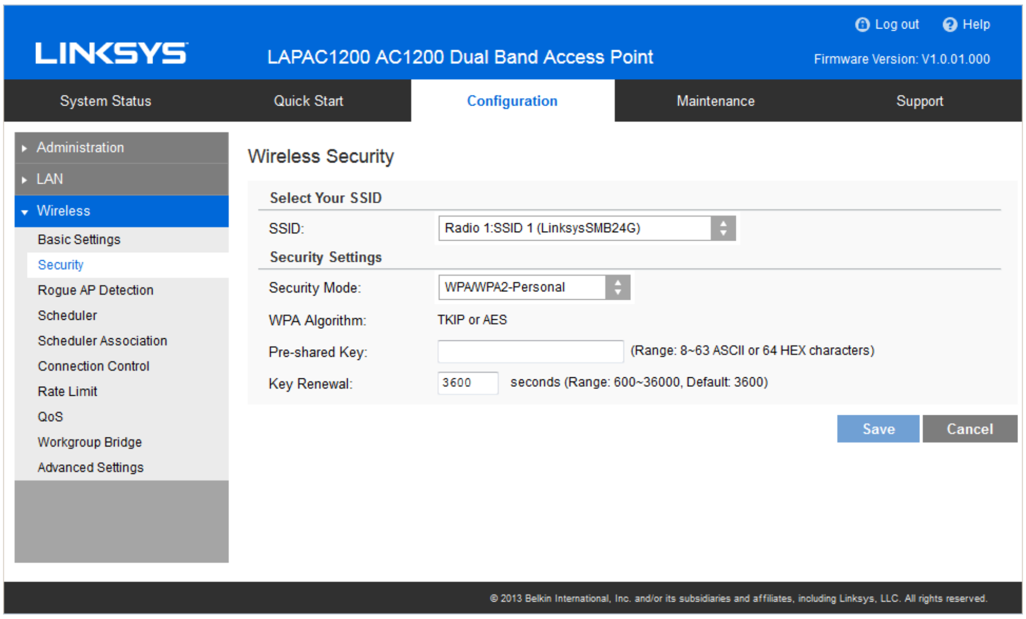
Figure 19: WPA2-Personal Wireless Security Screen

Data - 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. 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.



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode: WPA/WPA2-Personal

WPA Algorithm: TKIP or AES

Pre-shared Key: (Range: 8~63 ASCII or 64 HEX characters)

Key Renewal: 3600 seconds (Range: 600~36000, Default: 3600)

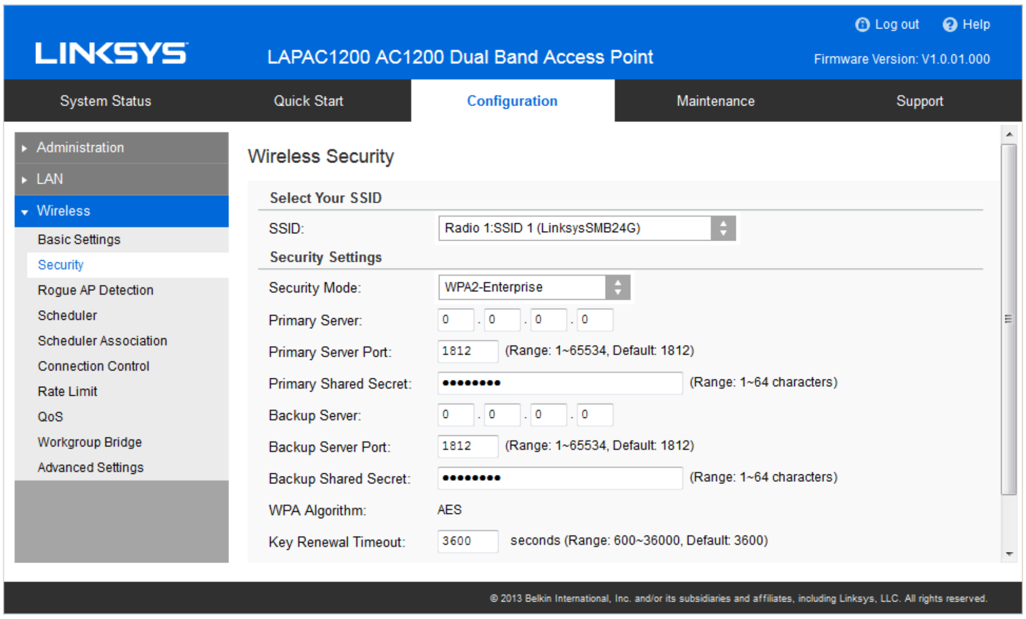
Figure 20: WPA/WPA2-Personal Wireless Security Screen

Data - 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. 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.



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode: WPA2-Enterprise

Primary Server: 0 . 0 . 0 . 0

Primary Server Port: 1812 (Range: 1~65534, Default: 1812)

Primary Shared Secret: •••••••• (Range: 1~64 characters)

Backup Server: 0 . 0 . 0 . 0

Backup Server Port: 1812 (Range: 1~65534, Default: 1812)

Backup Shared Secret: •••••••• (Range: 1~64 characters)

WPA Algorithm: AES

Key Renewal Timeout: 3600 seconds (Range: 600~36000, Default: 3600)

Figure 21: WPA2-Enterprise Wireless Security Screen

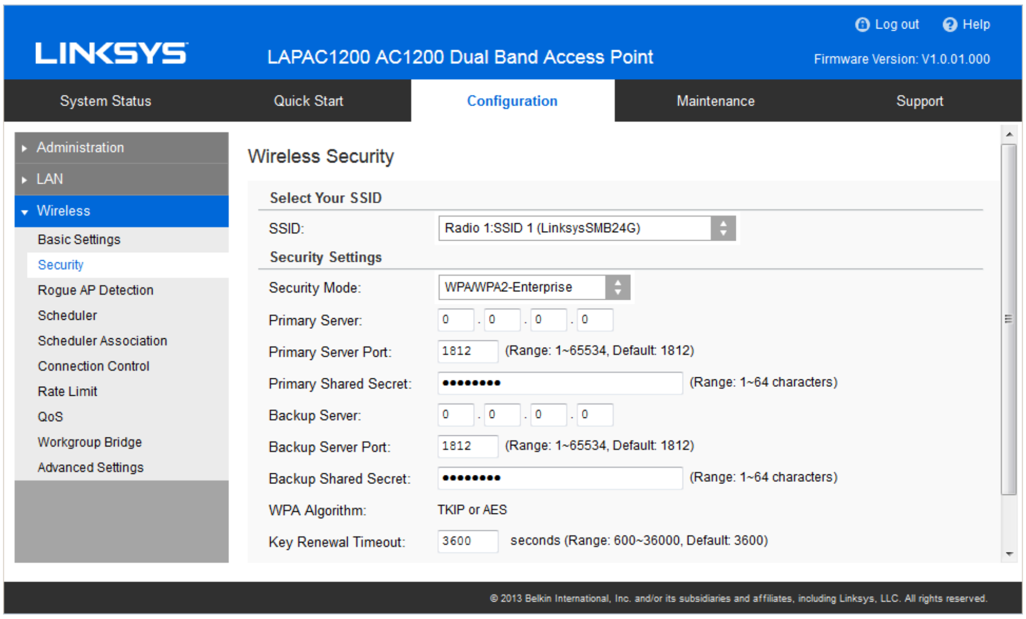
Data - WPA2-Enterprise Screen

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, and default is 3600. 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

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



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode: WPA/WPA2-Enterprise

Primary Server: 0 . 0 . 0 . 0

Primary Server Port: 1812 (Range: 1~65534, Default: 1812)

Primary Shared Secret: •••••••• (Range: 1~64 characters)

Backup Server: 0 . 0 . 0 . 0

Backup Server Port: 1812 (Range: 1~65534, Default: 1812)

Backup Shared Secret: •••••••• (Range: 1~64 characters)

WPA Algorithm: TKIP or AES

Key Renewal Timeout: 3600 seconds (Range: 600~36000, Default: 3600)

Figure 22: WPA/WPA2-Enterprise Wireless Security Screen

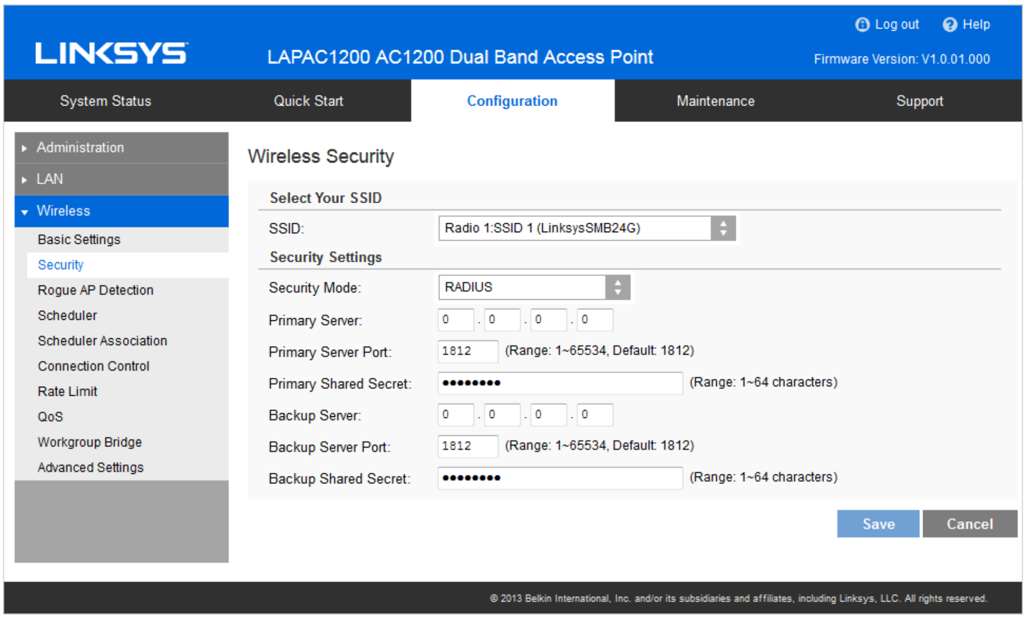
Data - WPA/WPA2-Enterprise Screen

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, and default is 3600. 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.



Wireless Security

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Security Settings

Security Mode:	RADIUS
Primary Server:	0 . 0 . 0 . 0
Primary Server Port:	1812 (Range: 1~65534, Default: 1812)
Primary Shared Secret:	•••••••• (Range: 1~64 characters)
Backup Server:	0 . 0 . 0 . 0
Backup Server Port:	1812 (Range: 1~65534, Default: 1812)
Backup Shared Secret:	•••••••• (Range: 1~64 characters)

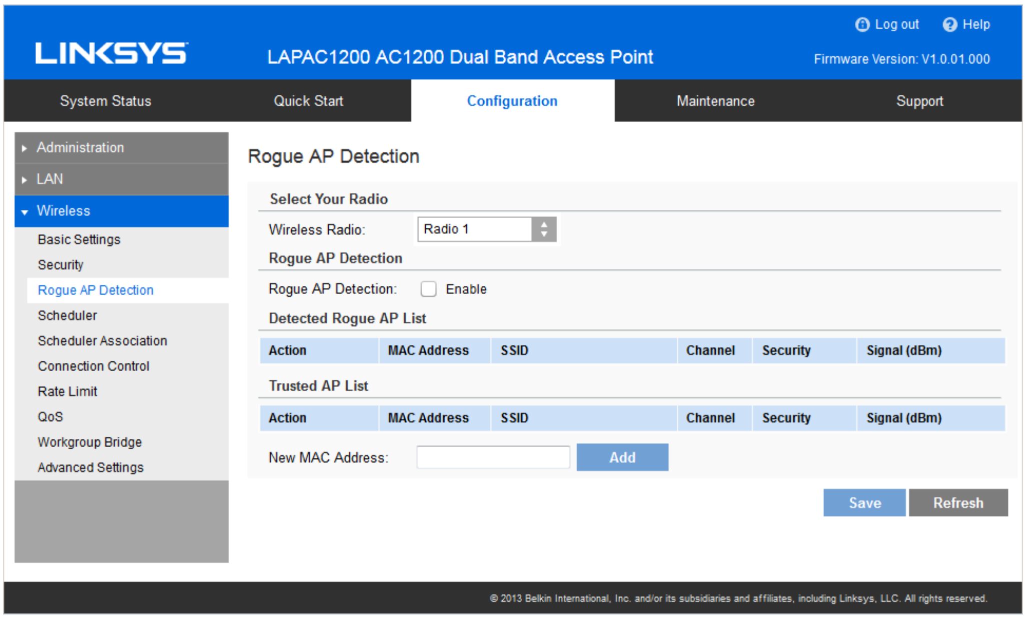
Figure 23: RADIUS Settings

Data - 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

Rogue AP detection is used to detect the unexpected or unauthorized access point installed in a secure network environment.



Rogue AP Detection

Select Your Radio

Wireless Radio: Radio 1

Rogue AP Detection

Rogue AP Detection: □ Enable

Detected Rogue AP List

Action	MAC Address	SSID	Channel	Security	Signal (dBm)

Trusted AP List

Action	MAC Address	SSID	Channel	Security	Signal (dBm)

New MAC Address:

Figure 24: Rogue AP Screen

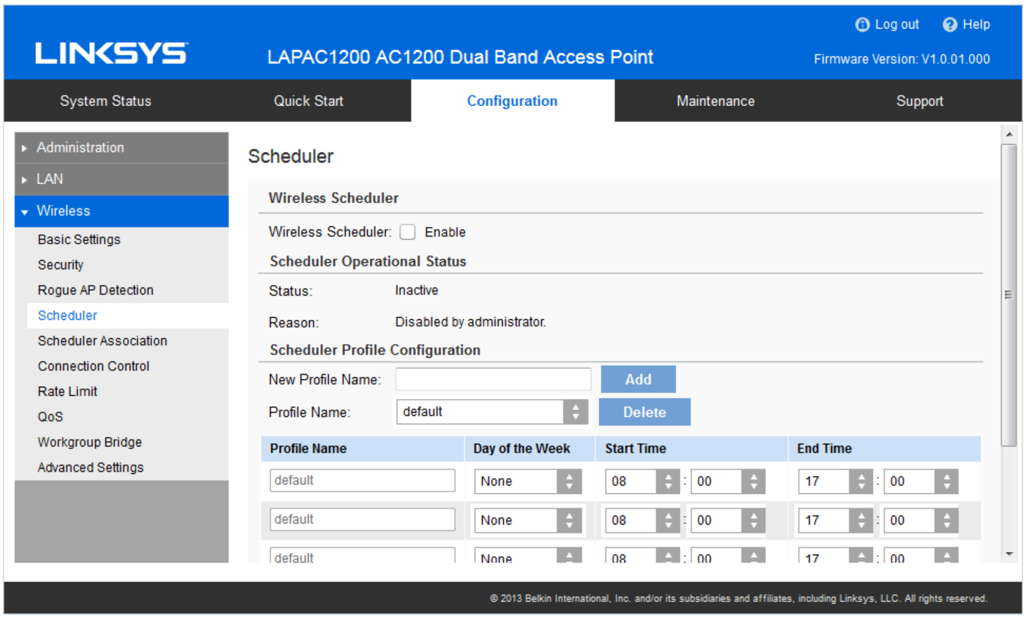
Data - Rogue AP Screen

Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
Rogue AP	Enable or disable Rogue AP Detection on the selected radio.
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 4 time rules.



Scheduler

Wireless Scheduler

Wireless Scheduler: □ Enable

Scheduler Operational Status

Status: Inactive

Reason: Disabled by administrator.

Scheduler Profile Configuration

New Profile Name:

Profile Name: default

Profile Name	Day of the Week	Start Time	End Time
default	None	08 : 00	17 : 00
default	None	08 : 00	17 : 00
default	None	08 : 00	17 : 00

Figure 25: Scheduler Screen

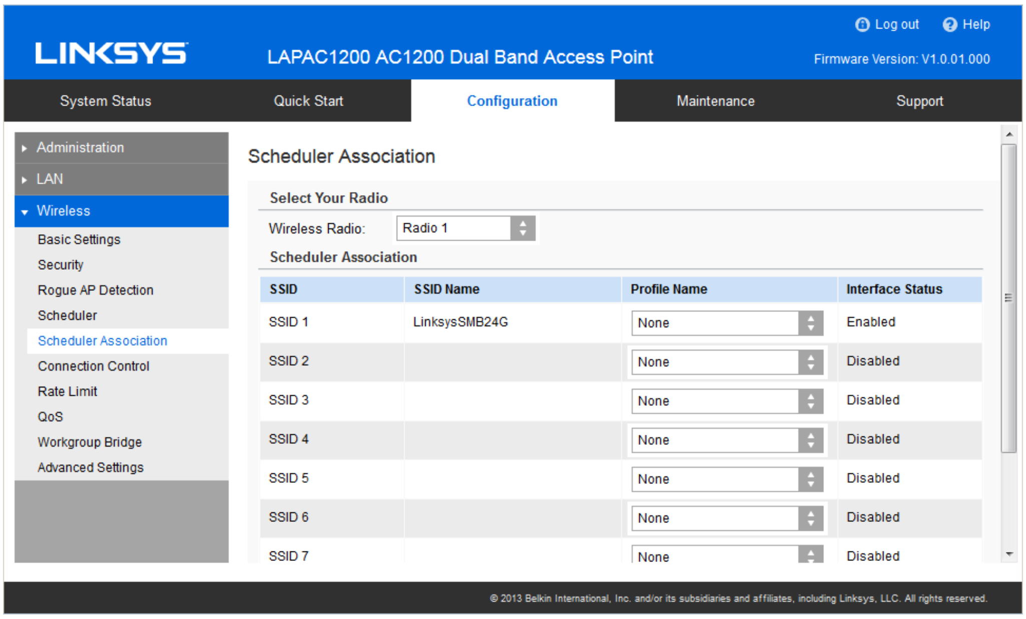
Data - Scheduler Screen

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 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.



Scheduler Association

Select Your Radio

Wireless Radio: Radio 1

Scheduler Association

SSID	SSID Name	Profile Name	Interface Status
SSID 1	LinksysSMB24G	None	Enabled
SSID 2		None	Disabled
SSID 3		None	Disabled
SSID 4		None	Disabled
SSID 5		None	Disabled
SSID 6		None	Disabled
SSID 7		None	Disabled

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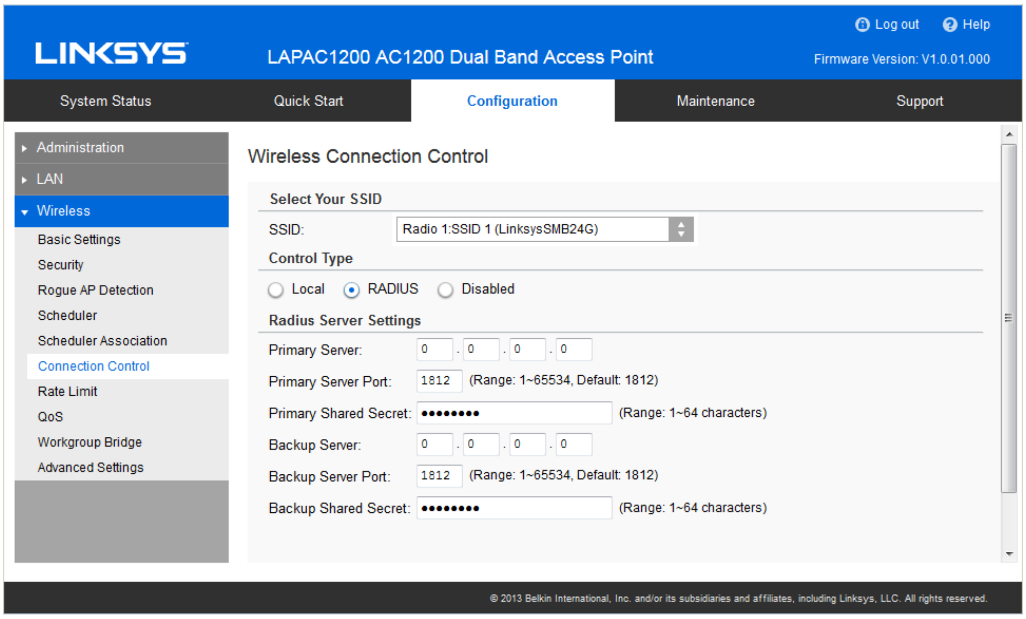
Figure 26: Scheduler Association Screen

Data - Scheduler Association Screen

Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
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.



Wireless Connection Control

Select Your SSID

SSID: Radio 1:SSID 1 (LinksysSMB24G)

Control Type

○ Local ● RADIUS ○ Disabled

Radius Server Settings

Primary Server:	0 . 0 . 0 . 0	
Primary Server Port:	1812	(Range: 1~65534, Default: 1812)
Primary Shared Secret:	••••••••	(Range: 1~64 characters)
Backup Server:	0 . 0 . 0 . 0	
Backup Server Port:	1812	(Range: 1~65534, Default: 1812)
Backup Shared Secret:	••••••••	(Range: 1~64 characters)

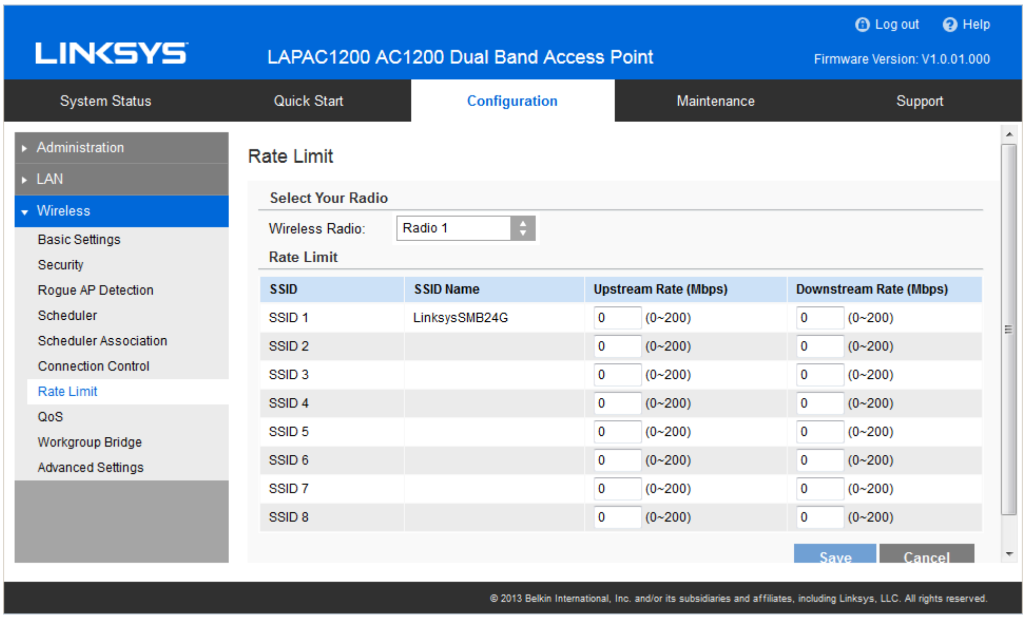
Figure 27: Connection Control Screen

Data - Connection Control Screen

SSID	Select the desired SSID from the list.
Connection 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 • Primary/Backup RADIUS Server - Enter the IP address of the RADIUS Server. • Primary/Backup RADIUS Server Port – Enter the Port number of the RADIUS Server. • Primary/Backup Shared Secret - This is shared between the wireless access point and the RADIUS Server while authenticating the device attempting to connect. • Disabled

Rate Limit

Limit downstream and upstream rate of SSIDs.



Rate Limit

Select Your Radio

Wireless Radio: Radio 1

Rate Limit

SSID	SSID Name	Upstream Rate (Mbps)	Downstream Rate (Mbps)
SSID 1	LinksysSMB24G	0 (0~200)	0 (0~200)
SSID 2		0 (0~200)	0 (0~200)
SSID 3		0 (0~200)	0 (0~200)
SSID 4		0 (0~200)	0 (0~200)
SSID 5		0 (0~200)	0 (0~200)
SSID 6		0 (0~200)	0 (0~200)
SSID 7		0 (0~200)	0 (0~200)
SSID 8		0 (0~200)	0 (0~200)

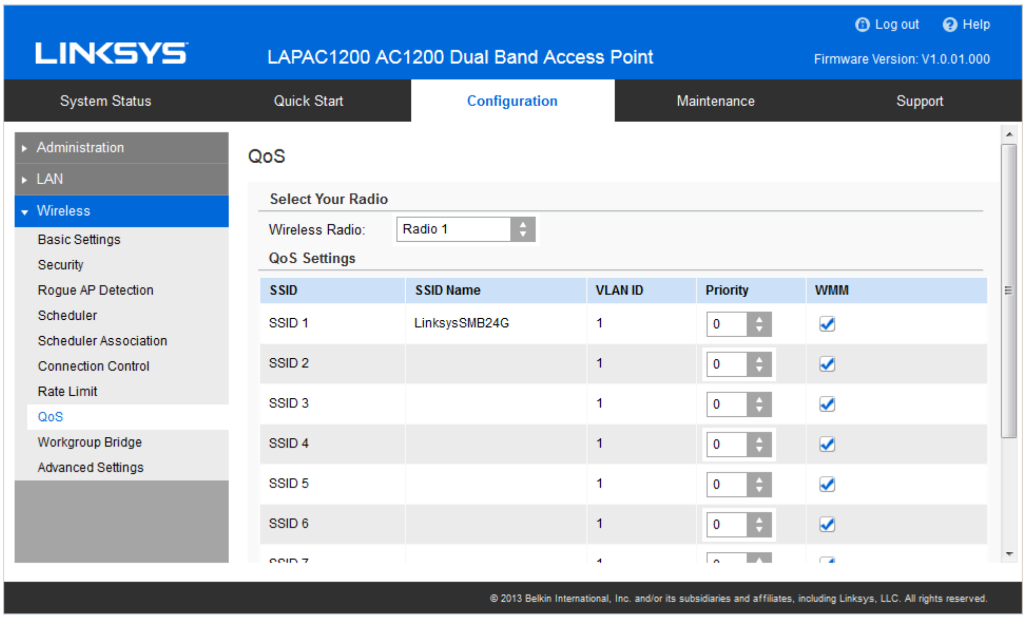
Figure 28: Rate Limit Screen

Data - Rate Limit Screen

Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
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.~~ Enter a maximum upstream for the SSID. The range is from 0 to 200 Mbps for Radio 1 and from 0 to 600 Mbps for Radio 2; 0 means no limitation.
Downstream Rate	~~Enter a maximum downstream for the SSID. The range is from 0 to 200 Mbps; 0 means no limitation.~~ Enter a maximum downstream for the SSID. The range is from 0 to 200 Mbps for Radio 1 and from 0 to 600 Mbps for Radio 2; 0 means no limitation.

QoS

The QoS (Quality of Service) feature allows you to 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.



QoS

Select Your Radio

Wireless Radio: Radio 1

QoS Settings

SSID	SSID Name	VLAN ID	Priority	WMM
SSID 1	LinksysSMB24G	1	0	☑
SSID 2		1	0	☑
SSID 3		1	0	☑
SSID 4		1	0	☑
SSID 5		1	0	☑
SSID 6		1	0	☑

Figure 29: QoS Screen

Data - QoS Screen

QoS Setting	
Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
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. The 802.1p will be included in the VLAN header of the packets which are received from the SSID and sent from Ethernet interface.

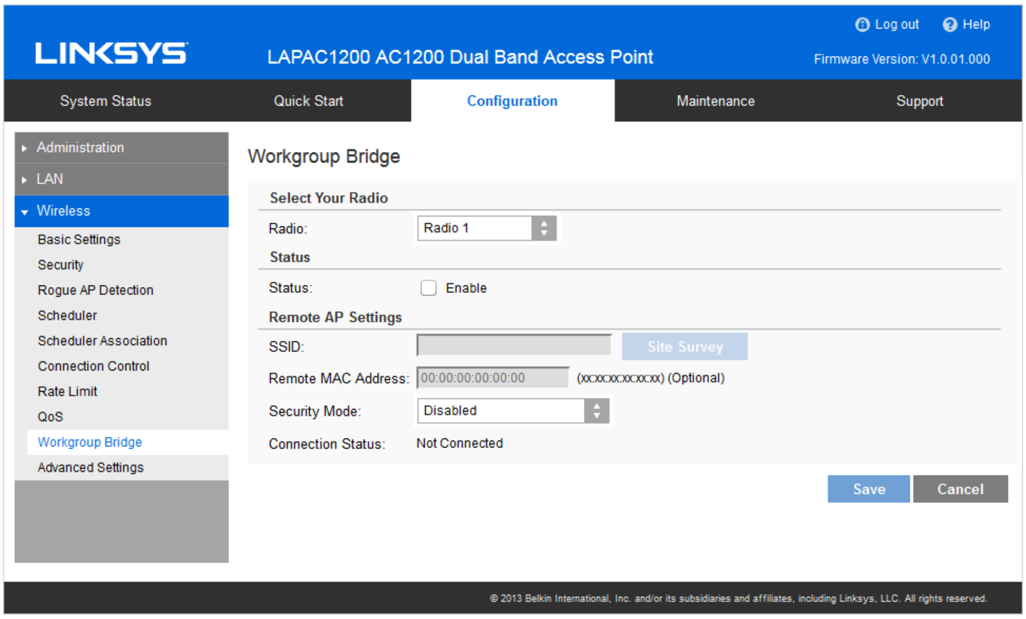
WMM	Enable or disable WMM. WMM (Wi-Fi Multimedia) is a component of the IEEE 802.11e wireless LAN standard for QoS. WMM provides prioritization of wireless data packets from different applications based on four access categories: voice, video, best effort, and background. For an application to receive 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.

Workgroup Bridge

Workgroup Bridge feature enables the access point to extend the accessibility of a remote network. In Workgroup Bridge mode, the access point acts as a wireless station (STA) 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).



Workgroup Bridge

Select Your Radio

Radio: Radio 1

Status

Status: □ Enable

Remote AP Settings

SSID:

Remote MAC Address: 00:00:00:00:00:00 (xx:xx:xx:xx:xx:xx) (Optional)

Security Mode: Disabled

Connection Status: Not Connected

Figure 30: Workgroup Bridge

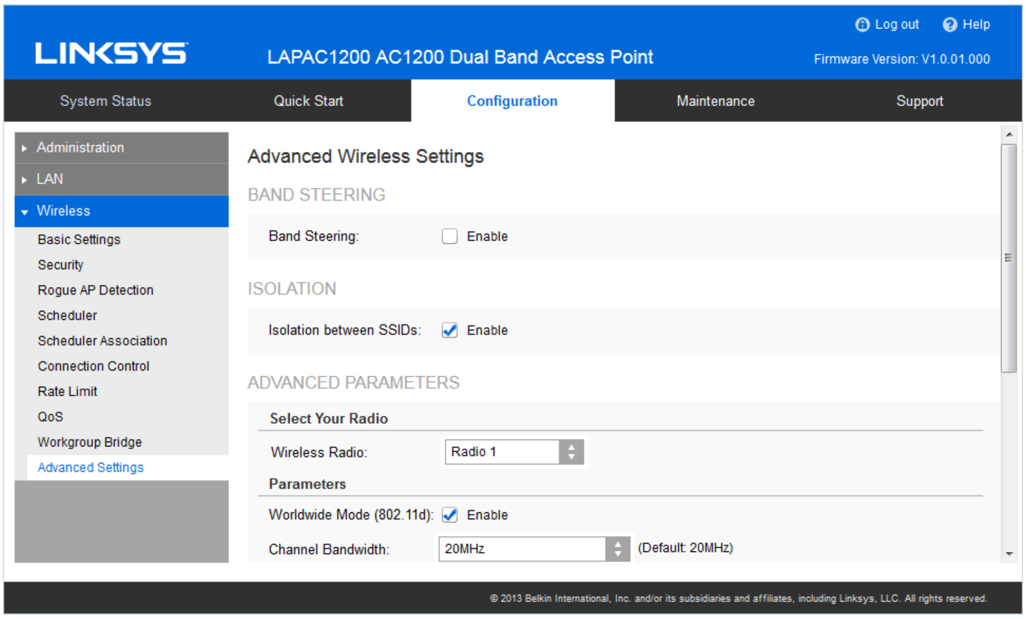
Data - Workgroup Bridge Screen

Workgroup Bridge	
Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
Workgroup Bridge Status	
Status	Enable or disable Workgroup Bridge function. Workgroup Bridge can only be enabled on one radio at a time when VLAN function is disabled Before configuring Workgroup Bridge, make sure all devices in Workgroup Bridge have the following identical settings. • Radio • IEEE 802.11 Mode • Channel Bandwidth • Channel (Auto is not recommended)

Infrastructure Client Interface	
SSID	Enter the name of the SSID to which Workgroup Bridge will connect. Click *Site Survey* button to choose from the list. It's necessary for Workgroup Bridge to connect to remote access point.
Remote MAC Address	Normally, Workgroup Bridge connects to a remote access point by matching SSID. When more than one remote access point 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

Advanced Settings

Configure advanced parameters of wireless radios.



Advanced Wireless Settings

BAND STEERING

Band Steering: □ Enable

ISOLATION

Isolation between SSIDs: ☑ Enable

ADVANCED PARAMETERS

Select Your Radio

Wireless Radio: Radio 1

Parameters

Worldwide Mode (802.11d): ☑ Enable

Channel Bandwidth: 20MHz (Default: 20MHz)

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Figure 31: Advanced Settings

Data - Advanced Settings Screen

Band Steering	
Band Steering	Enable or disable Band Steering function. Disabled by default. 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	
Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
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. When it is set to 40MHz, Wireless-N connections will use 40MHz channel, but Wireless-B connections and Wireless-G connections will still use 20MHz channel.~~ Select the designed channel bandwidth for the wireless radio. • 20MHz - Select if you are not using any 802.11n wireless clients. • 20/40MHz - Select if you are using both 802.11n and non-802.11n wireless devices. • 20/40/80MHz - Select if you are using 802.11ac, 802.11n and non-802.11n wireless devices.
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.

Chapter 3

Operation and Status

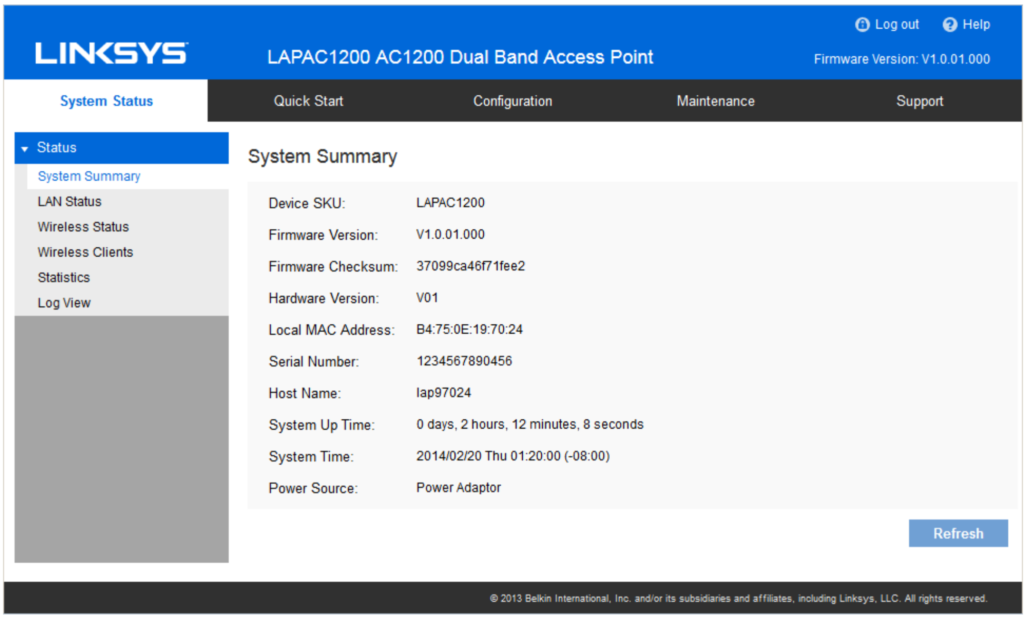
Operation

You may need to perform the following operations on a regular basis.

- If using the *Access Control* feature, update the *Trusted PC* database as required. (See *Access Control* in Chapter 2 for details.)
- If using 802.1x mode, update the *User Login* data on the Windows 2000 Server, and configure the client PCs, as required.

System Summary

Provide system status of the access point.



Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Status
System Summary
LAN Status
Wireless Status
Wireless Clients
Statistics
Log View
Refresh
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System Summary

Device SKU:	LAPAC1200
Firmware Version:	V1.0.01.000
Firmware Checksum:	37099ca46f71fee2
Hardware Version:	V01
Local MAC Address:	B4:75:0E:19:70:24
Serial Number:	1234567890456
Host Name:	lap97024
System Up Time:	0 days, 2 hours, 12 minutes, 8 seconds
System Time:	2014/02/20 Thu 01:20:00 (-08:00)
Power Source:	Power Adaptor

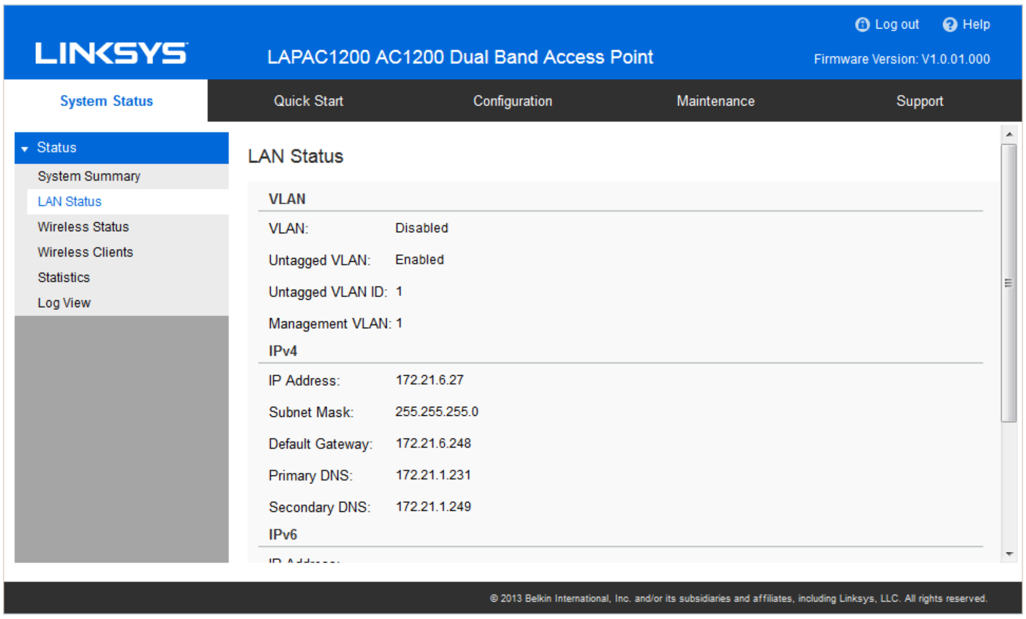
Figure 32: System Summary Screen

Data - 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.
Hardware Version	The version of the hardware.
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 will be displayed.
Buttons	
Refresh	Click to update the data on the screen.

LAN Status

LAN Status displays settings, and status of LAN interface.



LAPAC1200 AC1200 Dual Band Access Point

Firmware Version: V1.0.01.000

LAN Status

VLAN

VLAN: Disabled

Untagged VLAN: Enabled

Untagged VLAN ID: 1

Management VLAN: 1

IPv4

IP Address: 172.21.6.27

Subnet Mask: 255.255.255.0

Default Gateway: 172.21.6.248

Primary DNS: 172.21.1.231

Secondary DNS: 172.21.1.249

IPv6

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Figure 33: LAN Status Screen

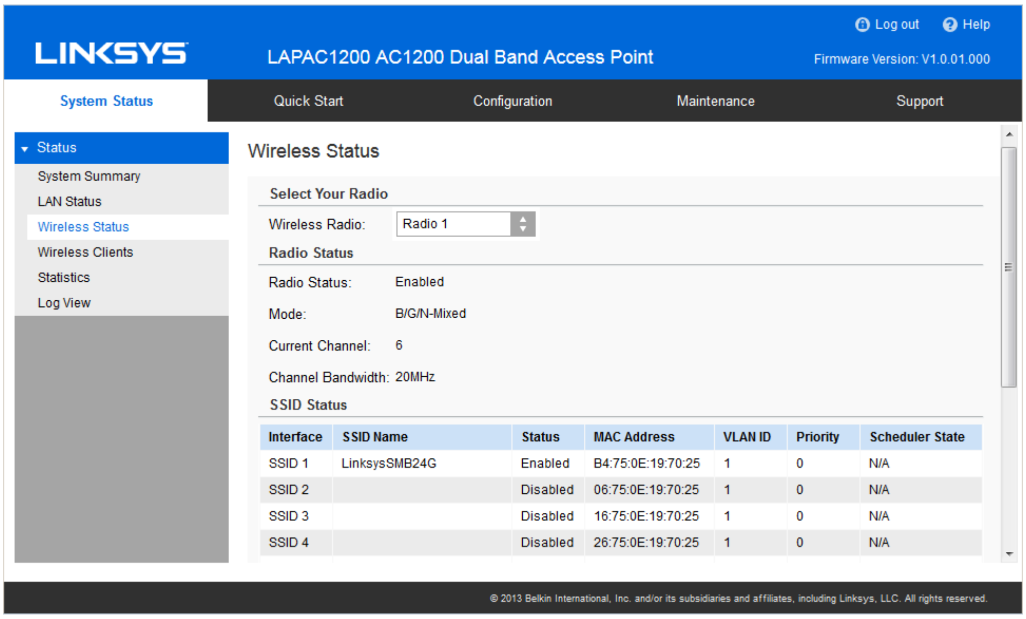
Data - LAN Status

VLAN	
VLAN	Enabled or disabled (default).
Untagged VLAN	Enabled (default) or disabled. When enabled, and if its VLAN ID is equal to Untagged VLAN ID, all traffic is untagged when sent from LAN ports. Untagged traffic can be accepted by LAN ports. If disabled, traffic is always tagged when sent from LAN port and only tagged traffic can be accept from LAN port. By default all traffic on the access point uses VLAN 1, the default untagged VLAN. This means that all traffic is untagged until you disable the untagged VLAN, change the untagged traffic VLAN ID, or change the VLAN ID for a SSID.
Untagged VLAN ID	Displays the untagged VLAN ID. Traffic on the VLAN that you specify in this field is not be tagged with a VLAN ID when forwarded to the network. VLAN 1 is the default ID for untagged VLAN and management 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 wireless radios and SSIDs.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
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Status
System Summary
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Wireless Status
Wireless Clients
Statistics
Log View
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Wireless Status

Select Your Radio

Wireless Radio: Radio 1

Radio Status

Radio Status: Enabled

Mode: B/G/N-Mixed

Current Channel: 6

Channel Bandwidth: 20MHz

SSID Status

Interface	SSID Name	Status	MAC Address	VLAN ID	Priority	Scheduler State
SSID 1	LinksysSMB24G	Enabled	B4:75:0E:19:70:25	1	0	N/A
SSID 2		Disabled	06:75:0E:19:70:25	1	0	N/A
SSID 3		Disabled	16:75:0E:19:70:25	1	0	N/A
SSID 4		Disabled	26:75:0E:19:70:25	1	0	N/A

Figure 34: Wireless Status Screen

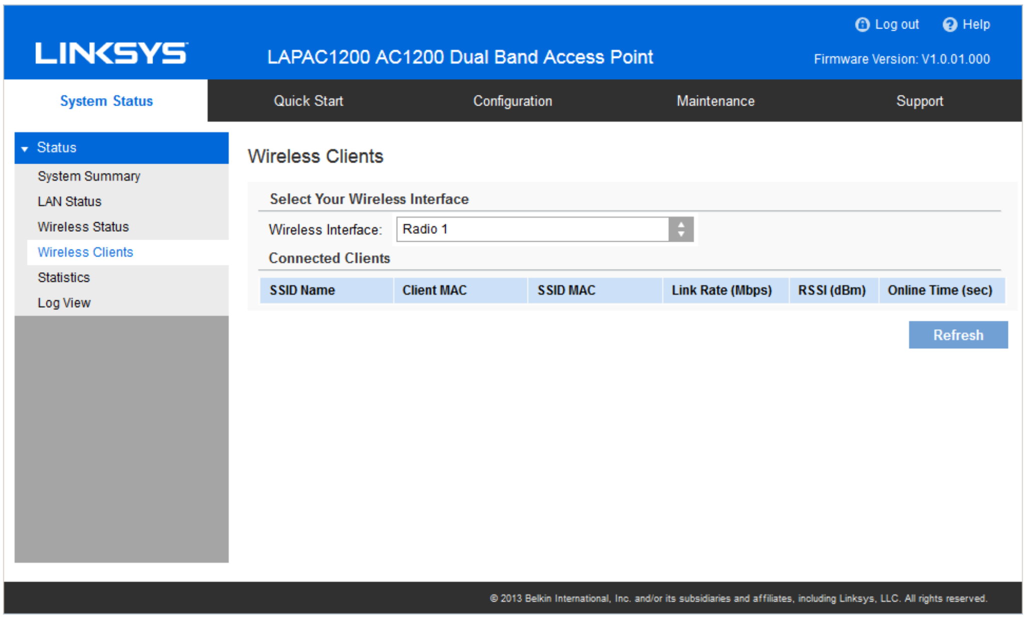
Data - Wireless Status

Radio Status	
Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
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. When set to 40 MHz, Wireless-N connections will use 40 MHz channel, but Wireless-B and Wireless-G will still use 20 MHz channel.~~ • 20MHz - Select if you are not using any 802.11n wireless clients. • 20/40MHz - Select if you are using both 802.11n and non-802.11n wireless devices. • 20/40/80MHz - Select if you are using 802.11ac, 802.11n and non-802.11n wireless devices.
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.
Workgroup Bridge Status	
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 display connected clients based on each wireless interface.



LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Log out
Help
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Status
System Summary
LAN Status
Wireless Status
Wireless Clients
Statistics
Log View
Refresh
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Wireless Clients

Select Your Wireless Interface

Wireless Interface: Radio 1

Connected Clients

SSID Name	Client MAC	SSID MAC	Link Rate (Mbps)	RSSI (dBm)	Online Time (sec)

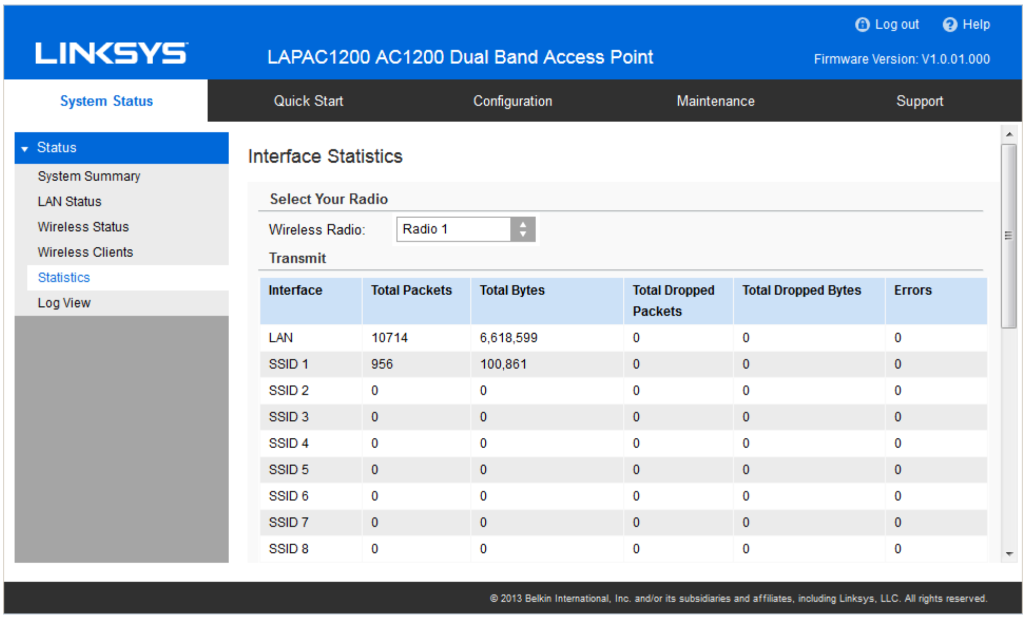
Figure 35: Wireless Clients Screen

Data - Wireless Clients

Wireless Interface	Select the desired interface from the list. The interfaces include 8 SSIDs per radio.
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. Unit is Mbps.
RSSI	The signal strength of the client. Unit is dBm.
Online Time	How long this client has been online. Unit is seconds.

Statistics

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



Interface Statistics

Select Your Radio

Wireless Radio: Radio 1

Transmit

Interface	Total Packets	Total Bytes	Total Dropped Packets	Total Dropped Bytes	Errors
LAN	10714	6,618,599	0	0	0
SSID 1	956	100,861	0	0	0
SSID 2	0	0	0	0	0
SSID 3	0	0	0	0	0
SSID 4	0	0	0	0	0
SSID 5	0	0	0	0	0
SSID 6	0	0	0	0	0
SSID 7	0	0	0	0	0
SSID 8	0	0	0	0	0

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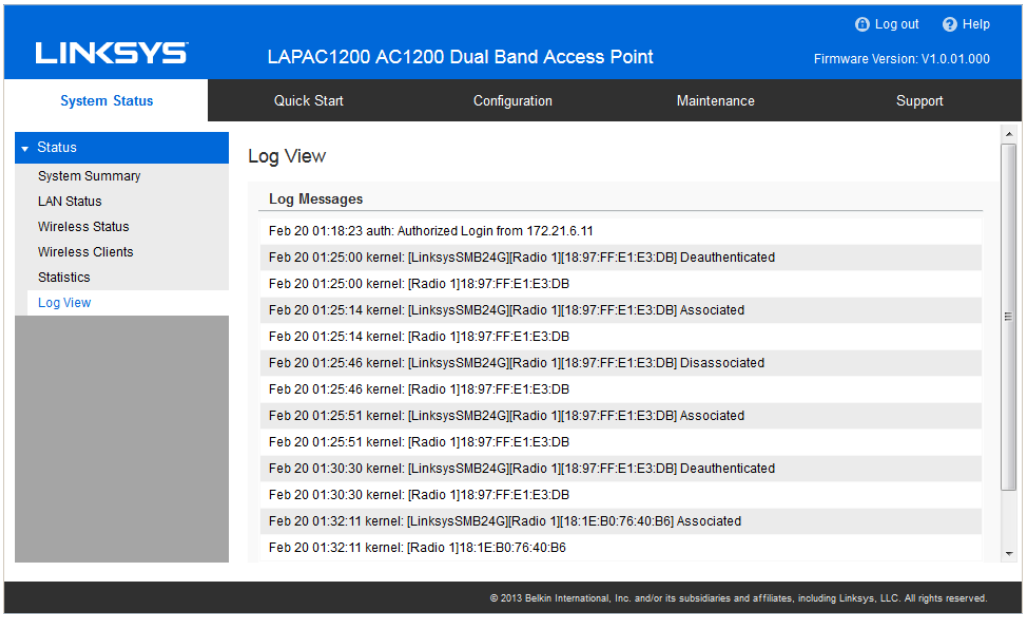
Figure 36: Statistics Screen

Data - Statistics

Wireless Radio	Select the desired radio from the list. Radio 1 is for 2.4 GHz, and Radio 2 is for 5 GHz.
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.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Status
System Summary
LAN Status
Wireless Status
Wireless Clients
Statistics
Log View
Log View
Log Messages
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```
Feb 20 01:18:23 auth: Authorized Login from 172.21.6.11
Feb 20 01:25:00 kernel: [LinksysSMB24G][Radio 1][18:97:FF:E1:E3:DB] Deauthenticated
Feb 20 01:25:00 kernel: [Radio 1]18:97:FF:E1:E3:DB
Feb 20 01:25:14 kernel: [LinksysSMB24G][Radio 1][18:97:FF:E1:E3:DB] Associated
Feb 20 01:25:14 kernel: [Radio 1]18:97:FF:E1:E3:DB
Feb 20 01:25:46 kernel: [LinksysSMB24G][Radio 1][18:97:FF:E1:E3:DB] Disassociated
Feb 20 01:25:46 kernel: [Radio 1]18:97:FF:E1:E3:DB
Feb 20 01:25:51 kernel: [LinksysSMB24G][Radio 1][18:97:FF:E1:E3:DB] Associated
Feb 20 01:25:51 kernel: [Radio 1]18:97:FF:E1:E3:DB
Feb 20 01:30:30 kernel: [LinksysSMB24G][Radio 1][18:97:FF:E1:E3:DB] Deauthenticated
Feb 20 01:30:30 kernel: [Radio 1]18:97:FF:E1:E3:DB
Feb 20 01:32:11 kernel: [LinksysSMB24G][Radio 1][18:1E:B0:76:40:B6] Associated
Feb 20 01:32:11 kernel: [Radio 1]18:1E:B0:76:40:B6
```

Figure 37: Log View Screen

Data - Log View

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 device.

Chapter 4

Access point Management

4

Overview

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 Linksys support website (http://www.linksys.com/business/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 Ethernet cable. Device will reboot automatically after firmware upgrade is completed.

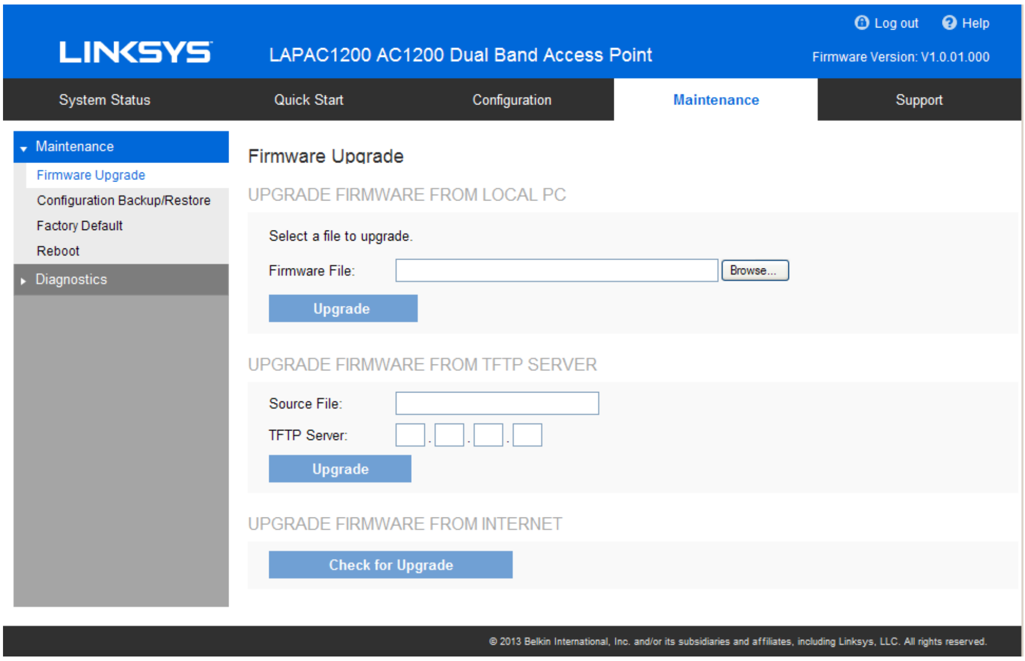
Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Firmware Upgrade
Configuration Backup/Restore
Factory Default
Reboot
Diagnostics
Firmware Upgrade
UPGRADE FIRMWARE FROM LOCAL PC
Select a file to upgrade.
Firmware File:
Browse...
Upgrade
UPGRADE FIRMWARE FROM TFTP SERVER
Source File:
TFTP Server:
Upgrade
UPGRADE FIRMWARE FROM INTERNET
Check for Upgrade
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Figure 38: 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 IP address of the TFTP server and the source file. The source file is the firmware filename you stored in your TFTP server. Only support IPv4 address here.
2. Click the *Upgrade* button to commence the firmware upgrade.

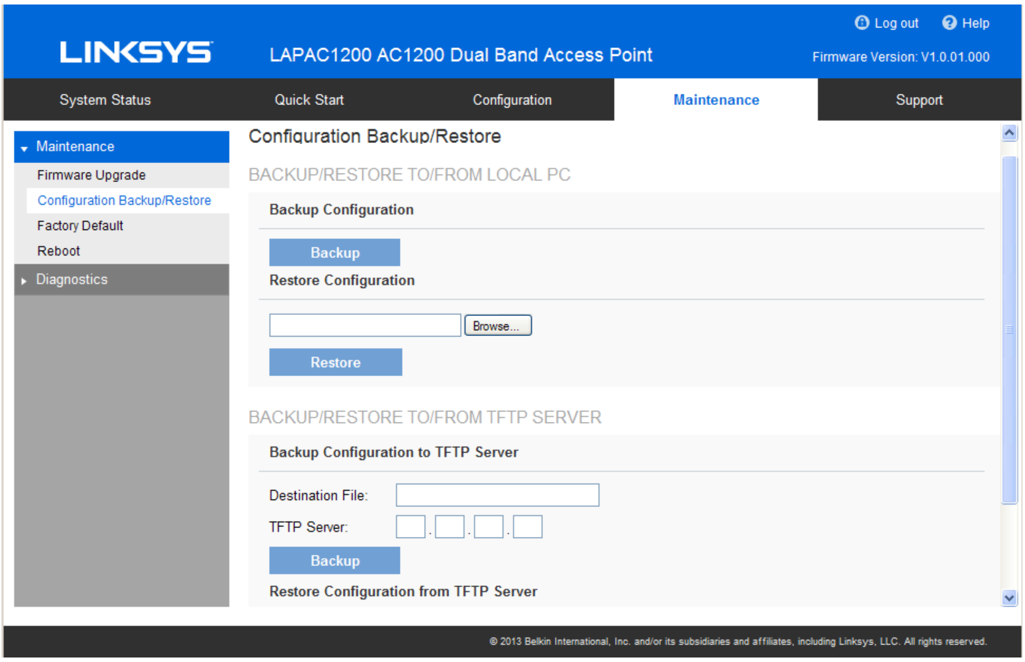
To perform the firmware upgrade from Internet:

1. Click ***Check for Upgrade*** to button to check if new firmware is available.

~~1.~~2. Click the ***Upgrade*** button to commence the firmware download and upgrade if new firmware is available.

Configuration

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



Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Firmware Upgrade
Configuration Backup/Restore
Factory Default
Reboot
Diagnostics
Configuration Backup/Restore
BACKUP/RESTORE TO/FROM LOCAL PC
Backup Configuration
Backup
Restore Configuration
Browse...
Restore
BACKUP/RESTORE TO/FROM TFTP SERVER
Backup Configuration to TFTP Server
Destination File:
TFTP Server:
Backup
Restore Configuration from TFTP Server
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Figure 39: Configuration Backup/Restore Screen

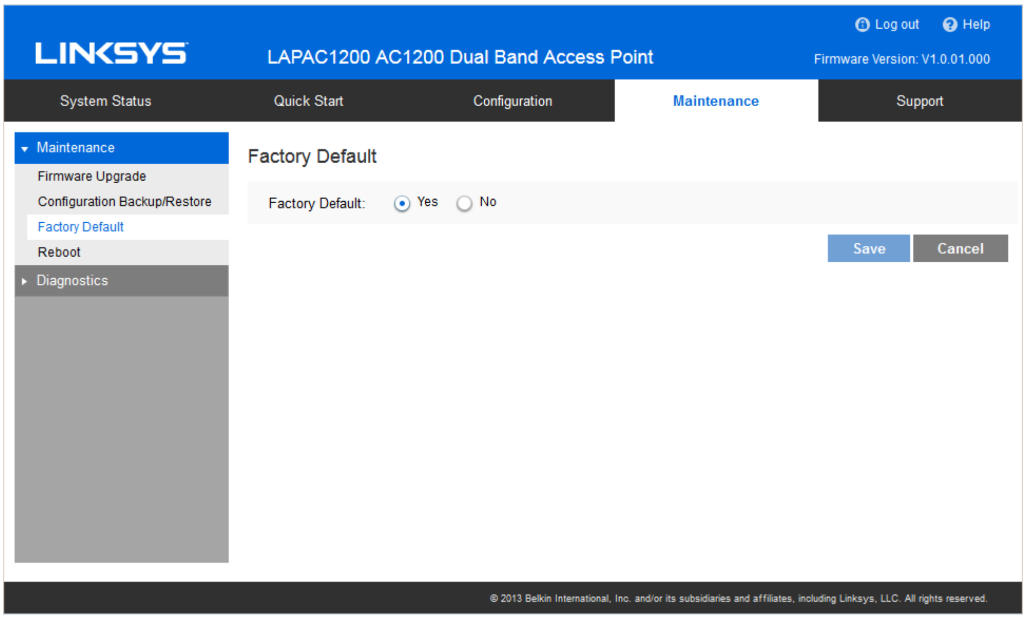
Data - Configuration Backup/Restore Screen

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 IP address for the TFTP server. Only support IPv4 address here. 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 IP address for the TFTP server. Only support IPv4 address here. 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.



Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Firmware Upgrade
Configuration Backup/Restore
Factory Default
Reboot
Diagnostics
Save
Cancel
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Factory Default

Factory Default: ● Yes ○ No

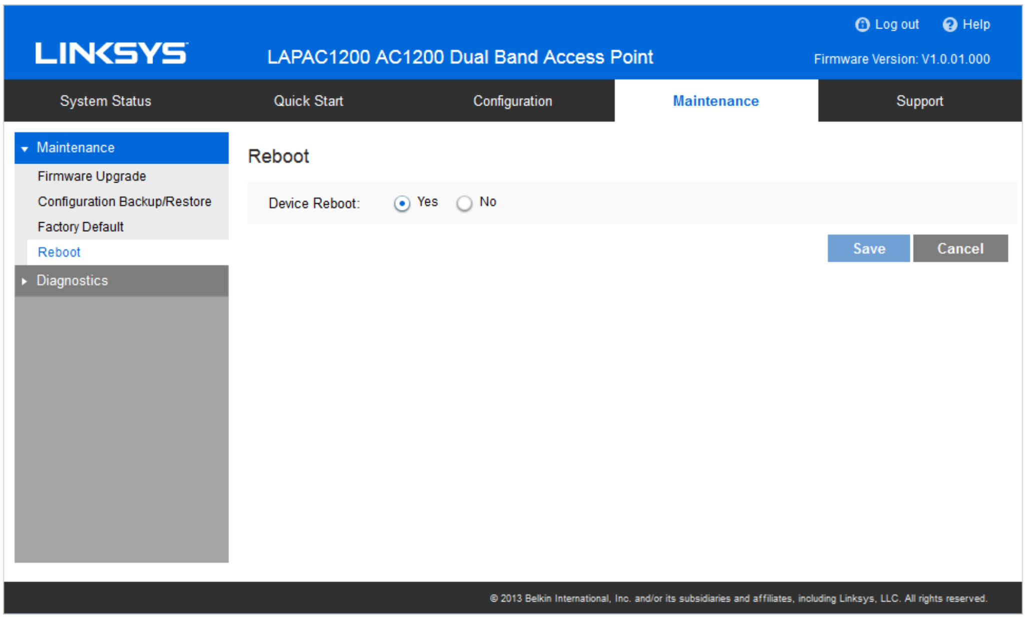
Figure 40: Factory Default Screen

Data - Factory Default Screen

Factory Default	If *Yes* radio button is clicked and Save button is pressed, your current configuration file will be deleted, and the system will reboot. The access point will go back to factory default mode after reboot.

Reboot

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


LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Log out
Help
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Firmware Upgrade
Configuration Backup/Restore
Factory Default
Reboot
Diagnostics
Save
Cancel
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Reboot

Device Reboot: ● Yes ○ No

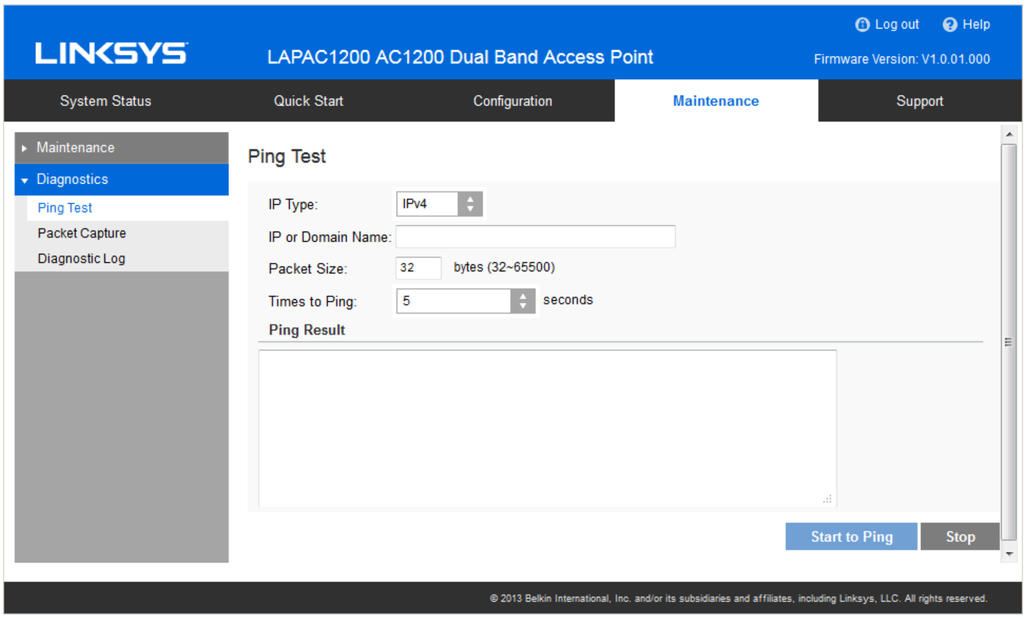
Figure 41: Reboot Screen

Data - Reboot Screen

Device Reboot	If *Yes* radio button is checked, device will power cycle after Save button is pressed.

Ping Test

Ping Test is used to determine the accessibility of a host on the network.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Diagnostics
Ping Test
Packet Capture
Diagnostic Log
Start to Ping
Stop
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Ping Test

IP Type: IPv4

IP or Domain Name:

Packet Size: 32 bytes (32~65500)

Times to Ping: 5 seconds

Ping Result

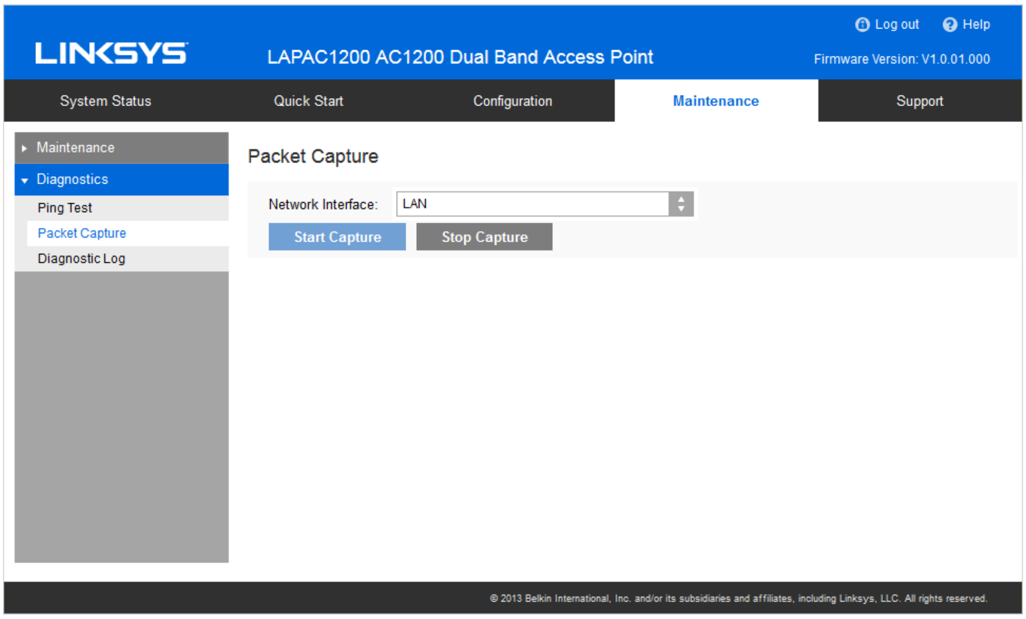
Figure 42: Ping Test Screen

Data - 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

Packet Capture is used to capture and store 802.3 packets received and transmitted by the access point based on one specified network interface. Network interface can be radio, SSID or LAN.


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Diagnostics
Ping Test
Packet Capture
Diagnostic Log
Start Capture
Stop Capture
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Packet Capture

Network Interface: LAN

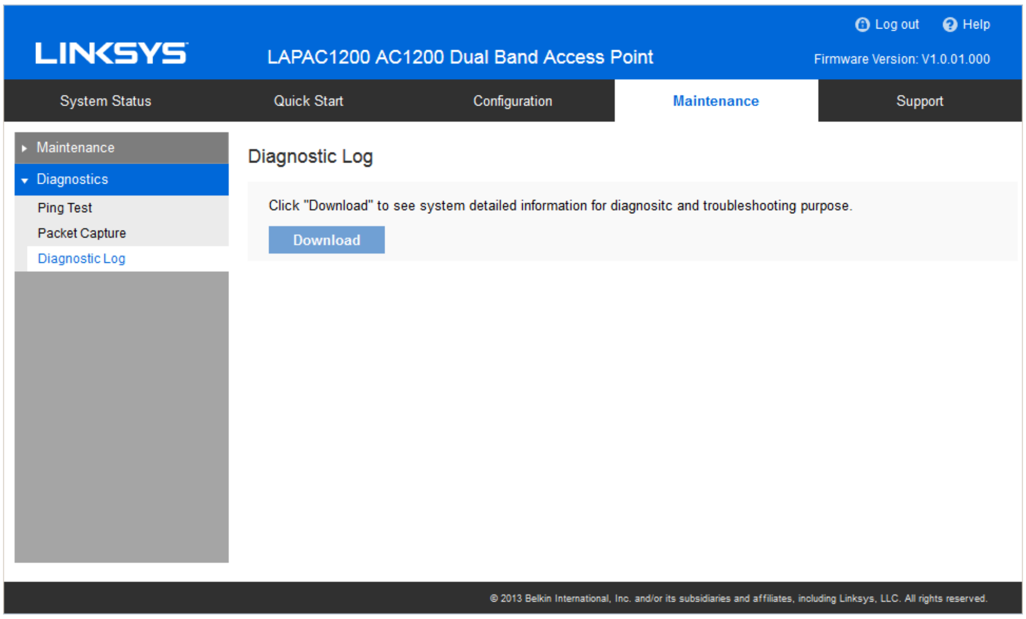
Figure 43: Packet Size Screen

Data - Packet Size Screen

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


Log out
Help
LINKSYS
LAPAC1200 AC1200 Dual Band Access Point
Firmware Version: V1.0.01.000
System Status
Quick Start
Configuration
Maintenance
Support
Maintenance
Diagnostics
Ping Test
Packet Capture
Diagnostic Log
Diagnostic Log
Download
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Click "Download" to see system detailed information for diagnositc and troubleshooting purpose.

Figure 44: Diagnostic Screen

Data - Diagnostic Screen

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

Appendix A

Troubleshooting

A

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

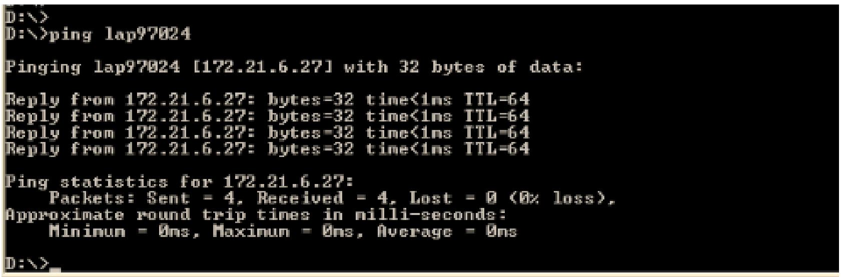
Problem 1: **I can't find new access point on my network.**

Solution 1: Check the following.

- 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

1. Open a MS-DOS Prompt or Command Prompt Window.
2. Use the Ping command to ping the wireless access point. Enter `ping` followed by the default name of the wireless access point. Default name is a string with "lap" and the last 5 characters of device MAC address. e.g.
   ping lap97024
3. Check the output of the ping command to determine the IP address of the wireless access point, as shown below.



```
D:\>
D:\>ping lap97024

Pinging lap97024 [172.21.6.27] with 32 bytes of data:

Reply from 172.21.6.27: bytes=32 time<1ms TTL=64
Reply from 172.21.6.27: bytes=32 time<1ms TTL=64
Reply from 172.21.6.27: bytes=32 time<1ms TTL=64
Reply from 172.21.6.27: bytes=32 time<1ms TTL=64

Ping statistics for 172.21.6.27:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

D:\>_
```

Figure 45: 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 Chapter 4 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. It is necessary to understand many of these terms in order to configure and operate a wireless LAN.

Wireless LAN Terminology

Modes

Wireless LANs can work in either of two (2) 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 which is transmitted by your wireless stations. If the data is encrypted, it is meaningless unless the receiver can decrypt it.

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** for radio 1 and **LinksysSMB5G** for radio 2. **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`** for radio 1 and **`LinksysSMB5G`** for radio 2. **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`** for radio 1 and **`LinksysSMB5G`** for radio 2. **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

1. Run *dcpromo.exe* from the command prompt.
2. Follow all of the default prompts, ensure that DNS is installed and enabled during installation.

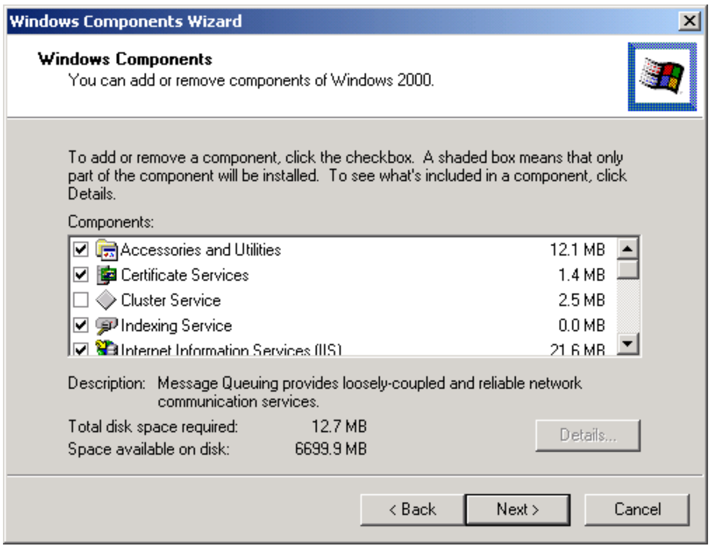
Services Installation

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.

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

World Wide Web Server. Select *World Wide Web Server* on the *Internet Information Services* (IIS) component.

From the *Networking Services* category, select *Dynamic Host Configuration Protocol* (DHCP), and *Internet Authentication Service* (DNS should already be selected and installed).



Windows Components
You can add or remove components of Windows 2000.

To add or remove a component, click the checkbox. A shaded box means that only part of the component will be installed. To see what's included in a component, click Details.

Components:

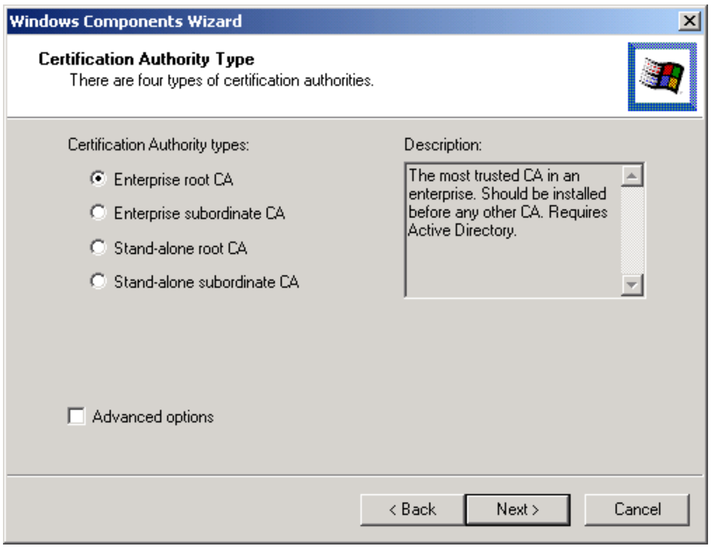
☑	Accessories and Utilities	12.1 MB
☑	Certificate Services	1.4 MB
□	Cluster Service	2.5 MB
☑	Indexing Service	0.0 MB
☑	Internet Information Services (IIS)	21.6 MB

Description: Message Queuing provides loosely-coupled and reliable network communication services.

Total disk space required: 12.7 MB
Space available on disk: 6699.9 MB

Figure 46: Components Screen

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



Certification Authority Type
There are four types of certification authorities.

Certification Authority types:

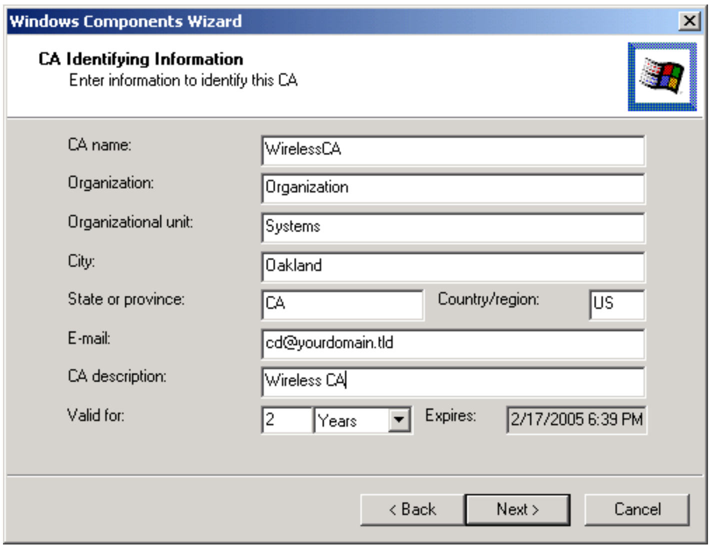
● Enterprise root CA
○ Enterprise subordinate CA
○ Stand-alone root CA
○ Stand-alone subordinate CA

Description:
The most trusted CA in an enterprise. Should be installed before any other CA. Requires Active Directory.

□ Advanced options

Figure 47: Certification Screen

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



CA Identifying Information
Enter information to identify this CA

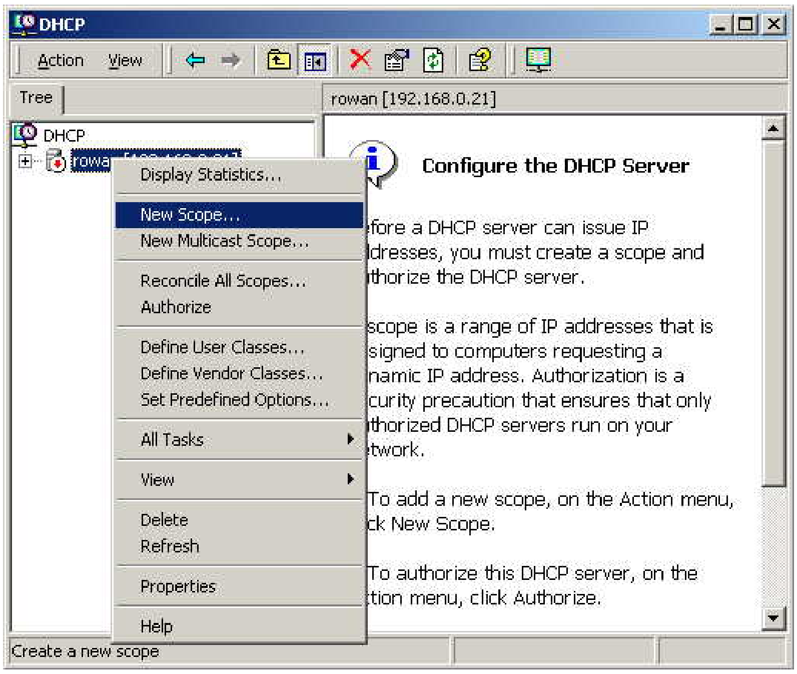
CA name: WirelessCA
Organization: Organization
Organizational unit: Systems
City: Oakland
State or province: CA
Country/region: US
E-mail: cd@yourdomain.tld
CA description: Wireless CA
Valid for: 2 Years
Expires: 2/17/2005 6:39 PM

Figure 48: 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*.



rowan [192.168.0.21]

Configure the DHCP Server

fore a DHCP server can issue IP
ddresses, you must create a scope and
thorize the DHCP server.

scope is a range of IP addresses that is
signed to computers requesting a
namic IP address. Authorization is a
curity precaution that ensures that only
thorized DHCP servers run on your
twork.

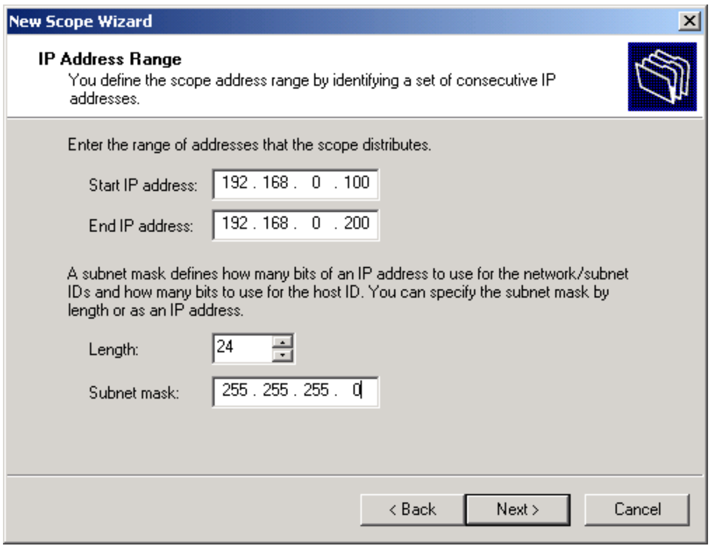
To add a new scope, on the Action menu,
ck New Scope.

To authorize this DHCP server, on the
tion menu, click Authorize.

Create a new scope

Figure 49: 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*.



New Scope Wizard

IP Address Range

You define the scope address range by identifying a set of consecutive IP addresses.

Enter the range of addresses that the scope distributes.

Start IP address: 192 . 168 . 0 . 100

End IP address: 192 . 168 . 0 . 200

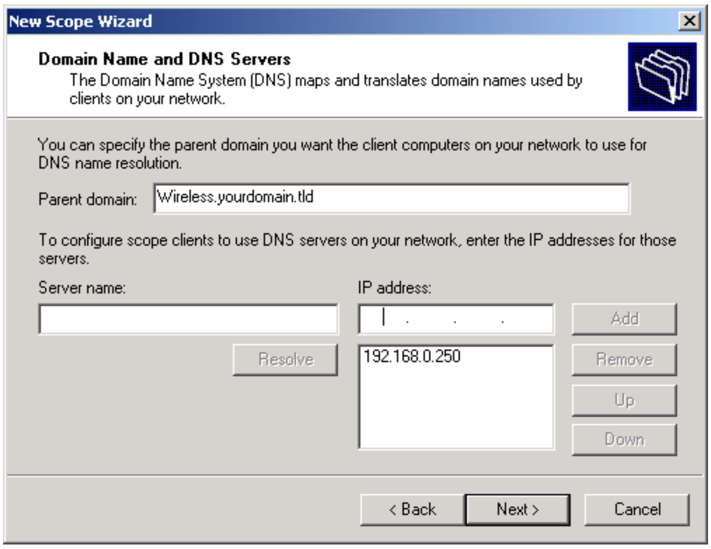
A subnet mask defines how many bits of an IP address to use for the network/subnet IDs and how many bits to use for the host ID. You can specify the subnet mask by length or as an IP address.

Length: 24

Subnet mask: 255 . 255 . 255 . 0

Figure 50: 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*.



New Scope Wizard

Domain Name and DNS Servers

The Domain Name System (DNS) maps and translates domain names used by clients on your network.

You can specify the parent domain you want the client computers on your network to use for DNS name resolution.

Parent domain: Wireless.yourdomain.tld

To configure scope clients to use DNS servers on your network, enter the IP addresses for those servers.

Server name:

IP address: . . .

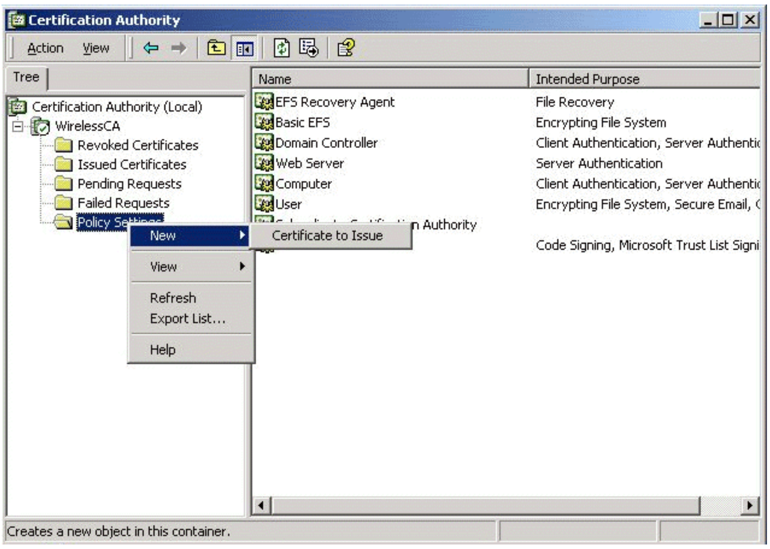
192.168.0.250

Figure 51: 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

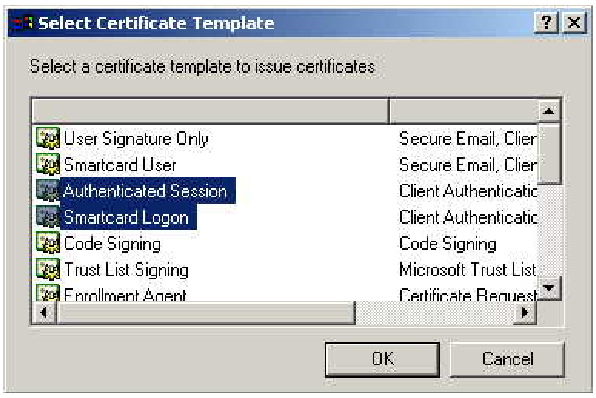
1. Select *Start -> Programs -> Administrative Tools -> Certification Authority*.
2. Right-click *Policy Settings*, and select *New -> Certificate to Issue*.



Name	Intended Purpose
EFS Recovery Agent	File Recovery
Basic EFS	Encrypting File System
Domain Controller	Client Authentication, Server Authentic
Web Server	Server Authentication
Computer	Client Authentication, Server Authentic
User	Encrypting File System, Secure Email, (
n Authority	
	Code Signing, Microsoft Trust List Signi

Figure 52: Certificate Authority Screen

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

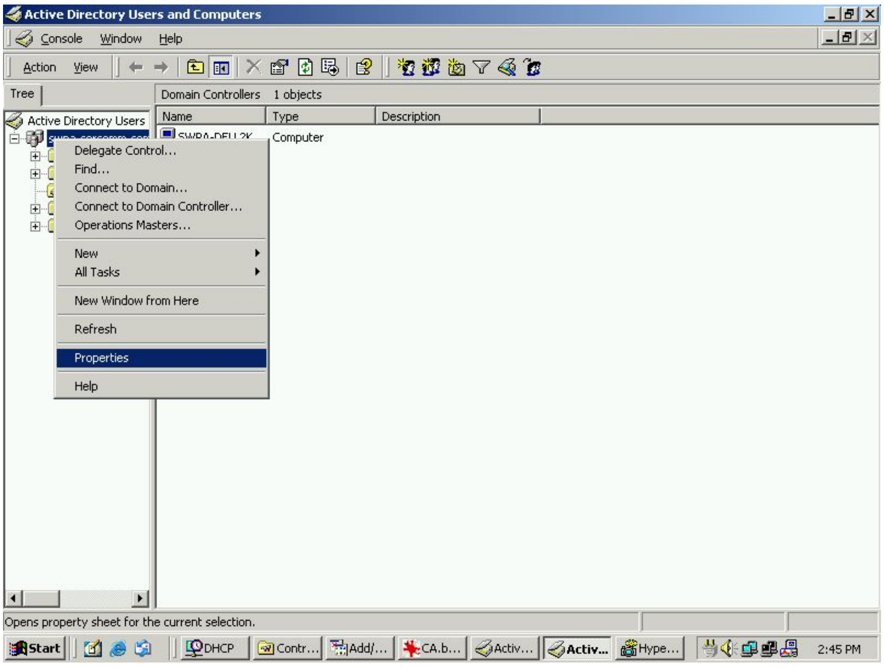


Select a certificate template to issue certificates

User Signature Only	Secure Email, Clier
Smartcard User	Secure Email, Clier
Authenticated Session	Client Authenticatic
Smartcard Logon	Client Authenticatic
Code Signing	Code Signing
Trust List Signing	Microsoft Trust List
Enrollment Agent	Certificate Request

Figure 53: Template Screen

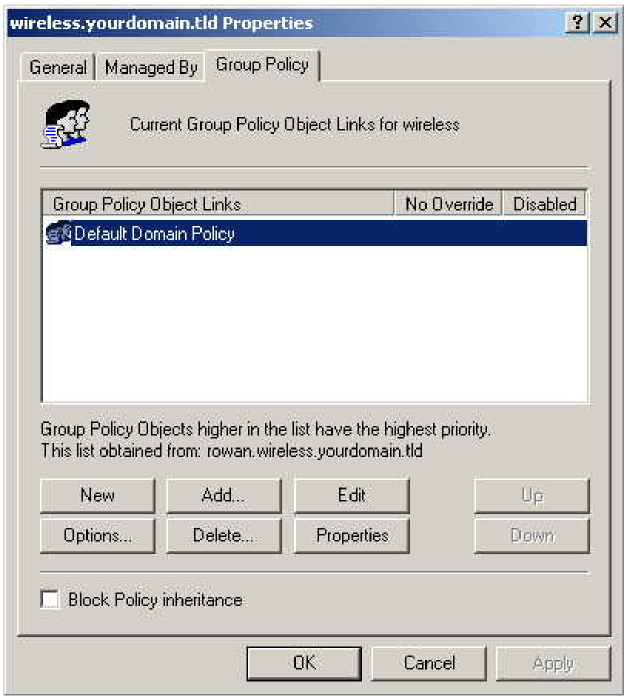
4. Select *Start -> Programs -> Administrative Tools -> Active Directory Users and Computers*.
5. Right-click on your active directory domain, and select *Properties*.



Opens property sheet for the current selection.

Figure 54: Active Directory Screen

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



Current Group Policy Object Links for wireless

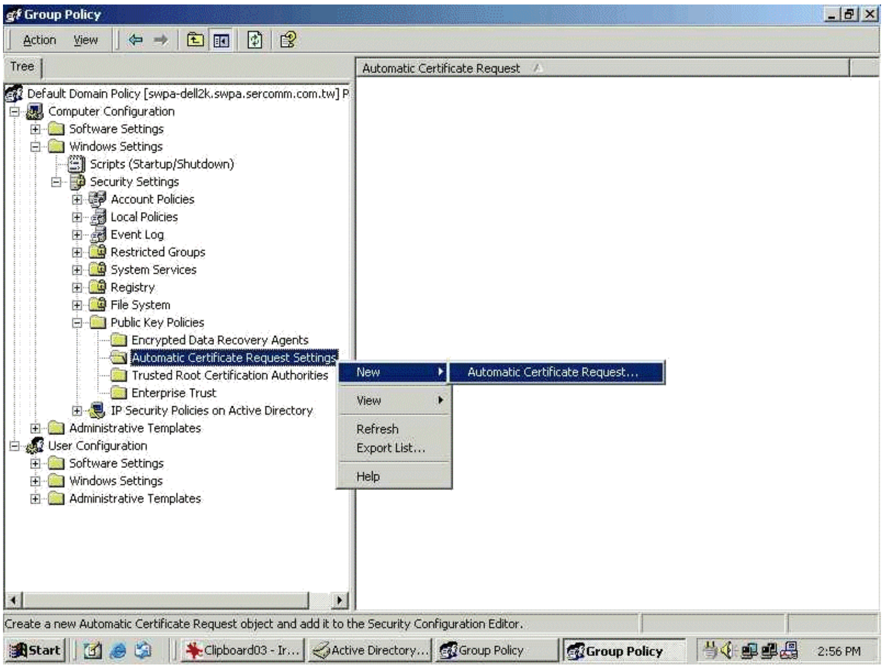
Group Policy Object Links	No Override	Disabled
Default Domain Policy		

Group Policy Objects higher in the list have the highest priority.
This list obtained from: rowan.wireless.yourdomain.tld

□ Block Policy inheritance

Figure 55: Group Policy Tab

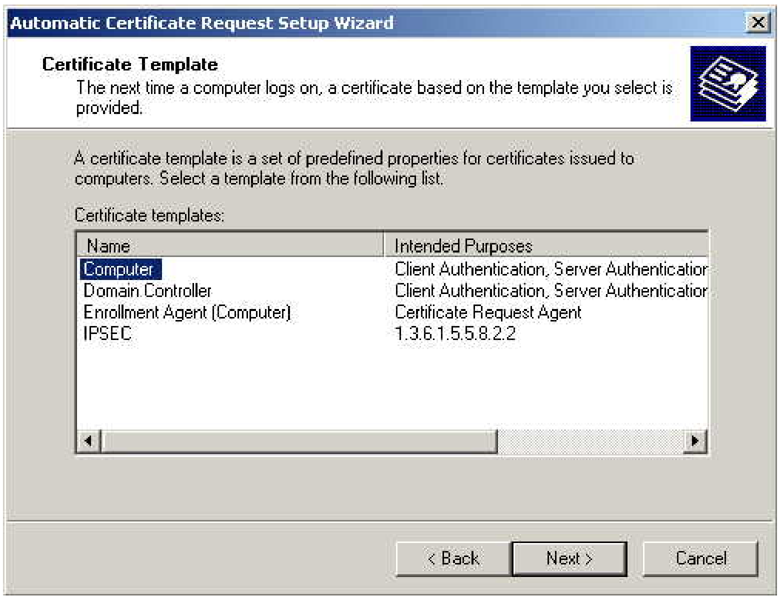
7. Select *Computer Configuration -> Windows Settings -> Security Settings -> Public Key Policies*, right-click *Automatic Certificate Request Settings -> New -> Automatic Certificate Request*.



Create a new Automatic Certificate Request object and add it to the Security Configuration Editor.

Figure 56: Group Policy Screen

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



Certificate Template

The next time a computer logs on, a certificate based on the template you select is provided.

A certificate template is a set of predefined properties for certificates issued to computers. Select a template from the following list.

Certificate templates:

Name	Intended Purposes
Computer	Client Authentication, Server Authenticatior
Domain Controller	Client Authentication, Server Authenticatior
Enrollment Agent (Computer)	Certificate Request Agent
IPSEC	1.3.6.1.5.5.8.2.2

Figure 57: 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*.

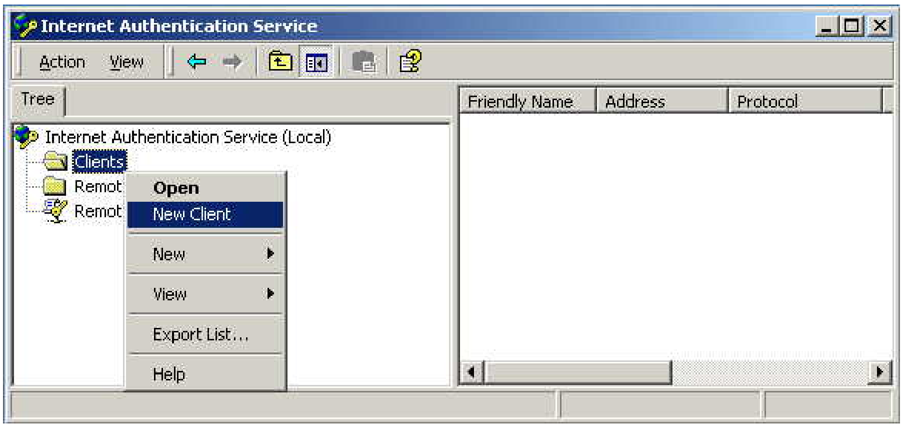
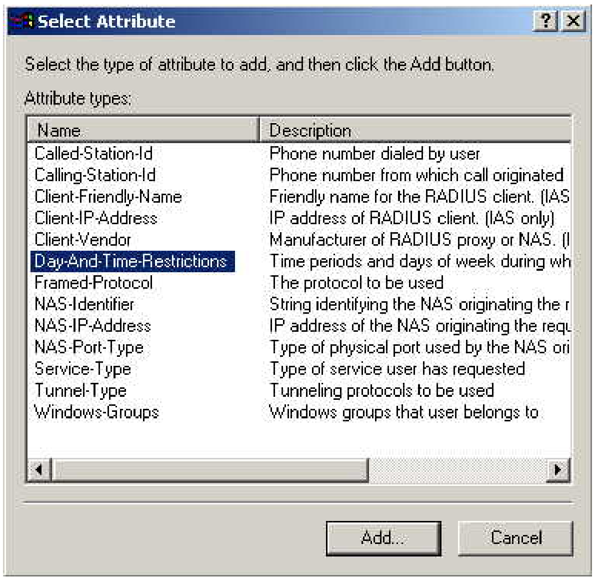


Figure 58: Service Screen

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...*



Select the type of attribute to add, and then click the Add button.

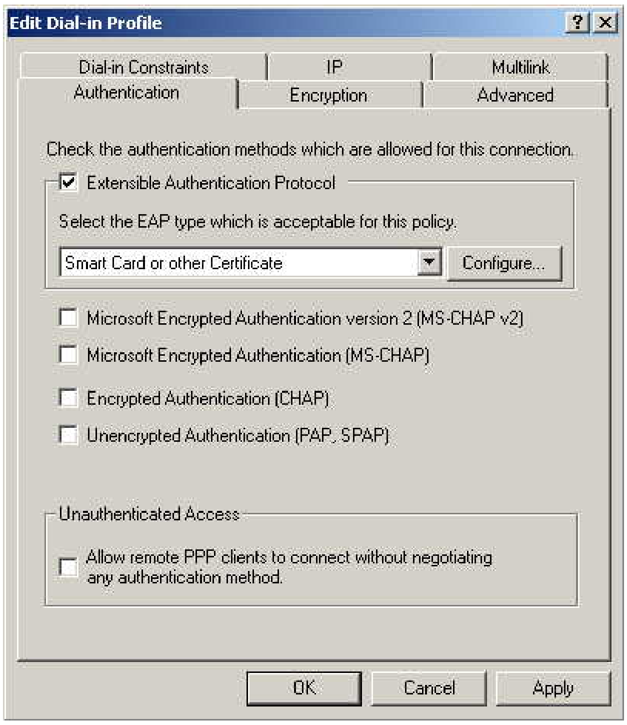
Attribute types:

Name	Description
Called-Station-Id	Phone number dialed by user
Calling-Station-Id	Phone number from which call originated
Client-Friendly-Name	Friendly name for the RADIUS client. (IAS
Client-IP-Address	IP address of RADIUS client. (IAS only)
Client-Vendor	Manufacturer of RADIUS proxy or NAS. (I
Day-And-Time-Restrictions	Time periods and days of week during wh
Framed-Protocol	The protocol to be used
NAS-Identifier	String identifying the NAS originating the r
NAS-IP-Address	IP address of the NAS originating the requ
NAS-Port-Type	Type of physical port used by the NAS ori
Service-Type	Type of service user has requested
Tunnel-Type	Tunneling protocols to be used
Windows-Groups	Windows groups that user belongs to

Figure 59: 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*.



Check the authentication methods which are allowed for this connection.

☑ Extensible Authentication Protocol

Select the EAP type which is acceptable for this policy.

Smart Card or other Certificate

□ Microsoft Encrypted Authentication version 2 (MS-CHAP v2)

□ Microsoft Encrypted Authentication (MS-CHAP)

□ Encrypted Authentication (CHAP)

□ Unencrypted Authentication (PAP, SPAP)

Unauthenticated Access

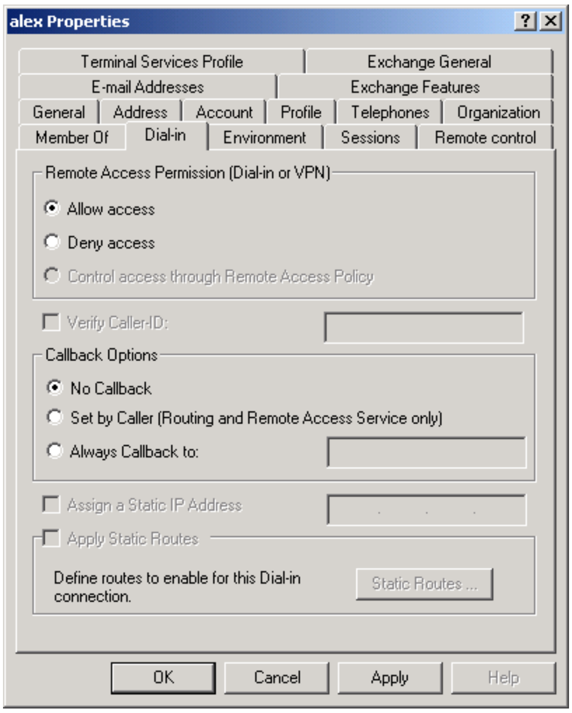
□ Allow remote PPP clients to connect without negotiating any authentication method.

Figure 60: 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*.



Remote Access Permission (Dial-in or VPN)

● Allow access

○ Deny access

○ Control access through Remote Access Policy

☐ Verify Caller-ID:

Callback Options

● No Callback

○ Set by Caller (Routing and Remote Access Service only)

○ Always Callback to:

☐ Assign a Static IP Address

☐ Apply Static Routes

Define routes to enable for this Dial-in connection.

Figure 61: 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.

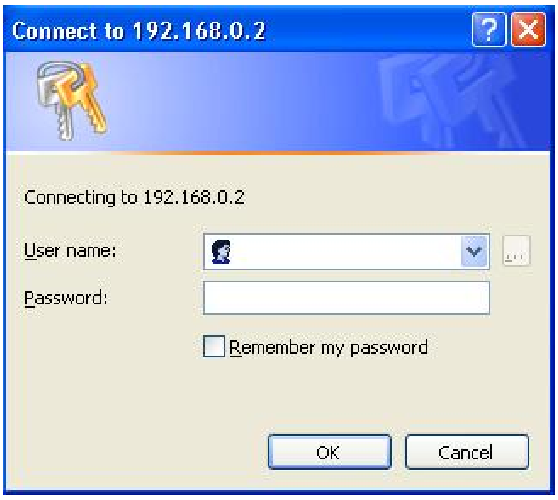
If you don't have either of these systems, you must use the 802.1x client software provided with your wireless adapter. Refer to your vendor's documentation for setup instructions.

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*
   e.g
   ```
   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*.



Connect to 192.168.0.2

Connecting to 192.168.0.2

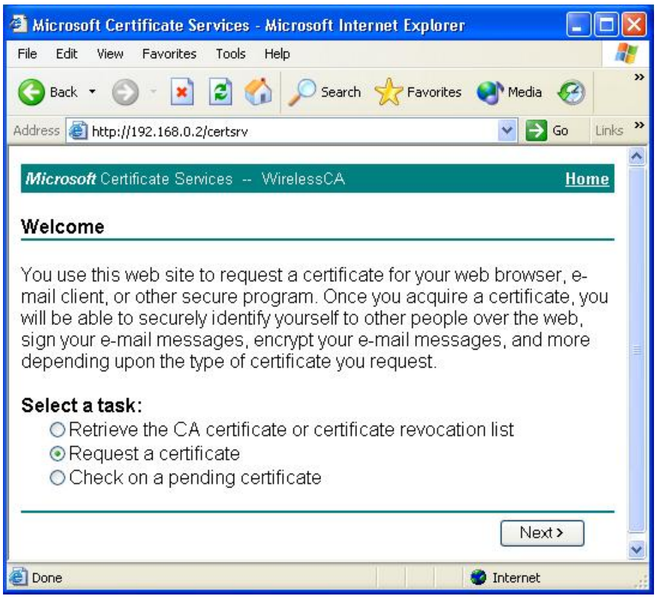
User name:

Password:

□ Remember my password

Figure 62: Connect Screen

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


Microsoft Certificate Services - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address Go Links
Home
Next >
Done
Internet

Address: http://192.168.0.2/certsrv

Microsoft Certificate Services -- WirelessCA

Welcome

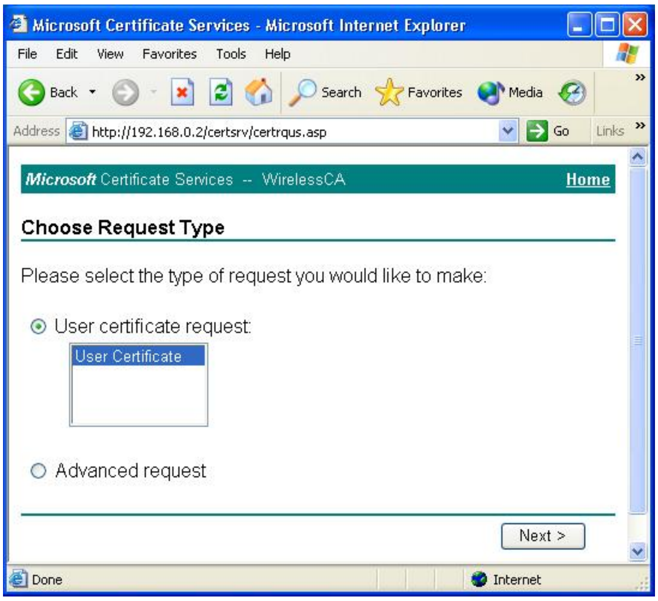
You use this web site to request a certificate for your web browser, e-mail client, or other secure program. Once you acquire a certificate, you will be able to securely identify yourself to other people over the web, sign your e-mail messages, encrypt your e-mail messages, and more depending upon the type of certificate you request.

Select a task:

○ Retrieve the CA certificate or certificate revocation list
● Request a certificate
○ Check on a pending certificate

Figure 63: Wireless CA Screen

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


Microsoft Certificate Services - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address Go Links
Home
Next >
Done
Internet

Address: http://192.168.0.2/certsrv/certrqus.asp

Microsoft Certificate Services -- WirelessCA

Choose Request Type

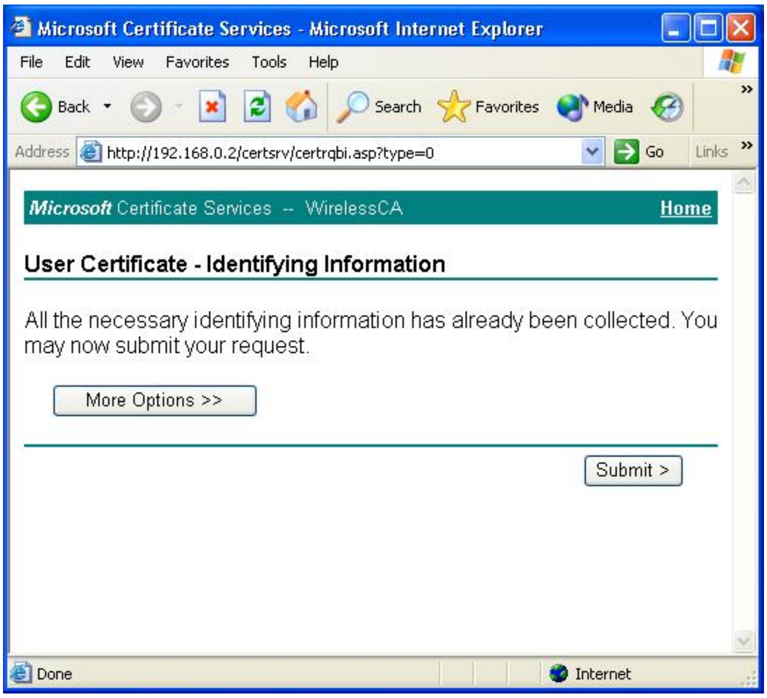
Please select the type of request you would like to make:

● User certificate request:
User Certificate

○ Advanced request

Figure 64: Request Type Screen

6. Click *Submit*.



Microsoft Certificate Services - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address
http://192.168.0.2/certsrv/certrqbi.asp?type=0
Go
Links
Microsoft Certificate Services -- WirelessCA
Home

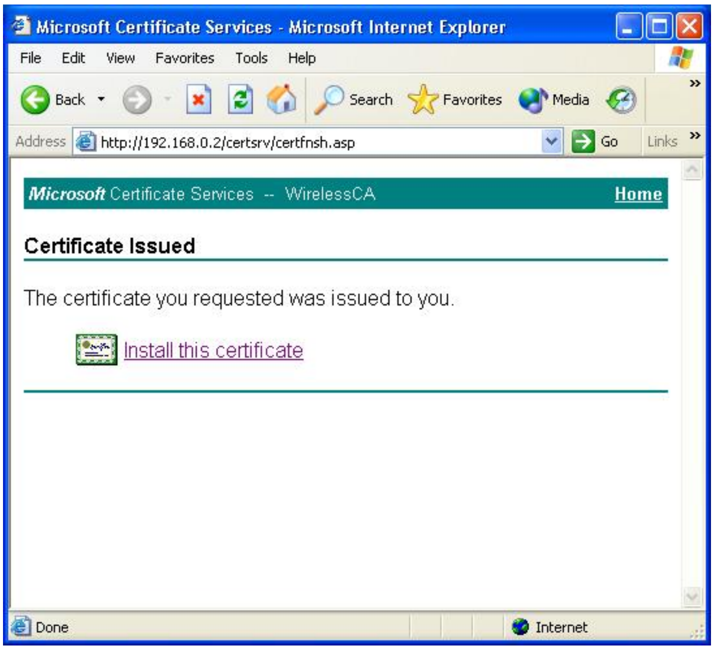
User Certificate - Identifying Information

All the necessary identifying information has already been collected. You may now submit your request.

More Options >>
Submit >
Done
Internet

Figure 65: Identifying Information Screen

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



Microsoft Certificate Services - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address
http://192.168.0.2/certsrv/certfnsh.asp
Go
Links
Microsoft Certificate Services -- WirelessCA
Home

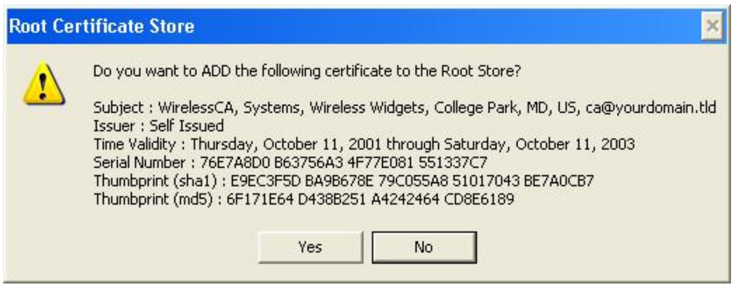
Certificate Issued

The certificate you requested was issued to you.

Install this certificate
Done
Internet

Figure 66: Certificate Issued Screen

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



Do you want to ADD the following certificate to the Root Store?

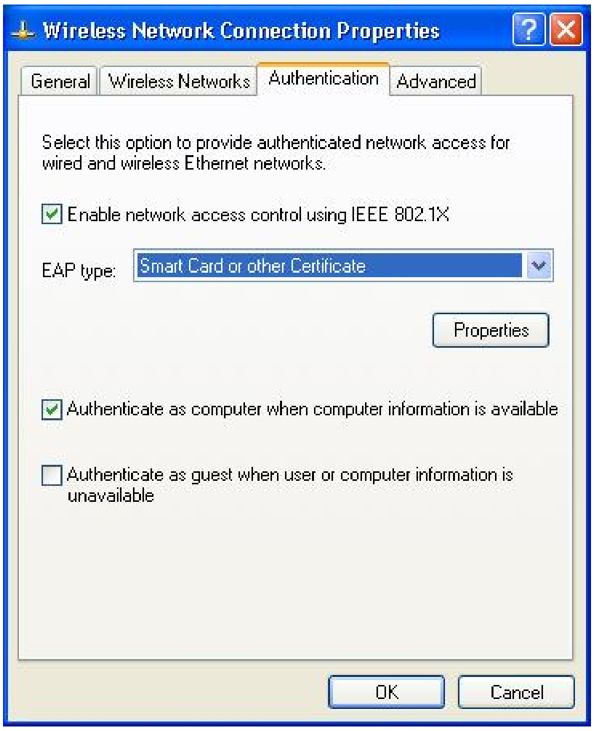
Subject : WirelessCA, Systems, Wireless Widgets, College Park, MD, US, ca@yourdomain.tld
Issuer : Self Issued
Time Validity : Thursday, October 11, 2001 through Saturday, October 11, 2003
Serial Number : 76E7A8D0 B63756A3 4F77E081 551337C7
Thumbprint (sha1) : E9EC3F5D BA9B678E 79C055A8 51017043 BE7A0CB7
Thumbprint (md5) : 6F171E64 D438B251 A4242464 CD8E6189

Figure 67: 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.



Select this option to provide authenticated network access for wired and wireless Ethernet networks.

☑ Enable network access control using IEEE 802.1X

EAP type: Smart Card or other Certificate

☑ Authenticate as computer when computer information is available

□ Authenticate as guest when user or computer information is unavailable

Figure 68: Authentication Tab

Encryption Settings

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

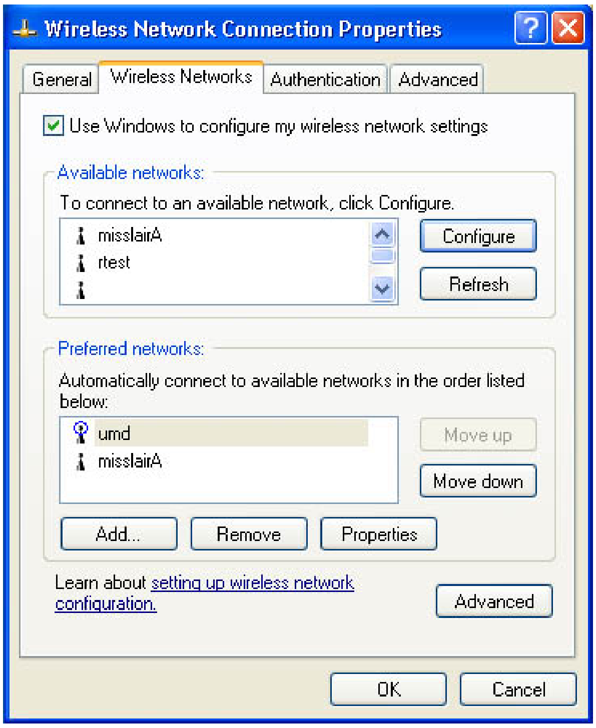
- Windows XP will detect any available wireless networks, and allow you to configure each network independently.

- 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.



Wireless Network Connection Properties

☑ Use Windows to configure my wireless network settings

Available networks:

To connect to an available network, click Configure.

misslairA
rtest

Preferred networks:

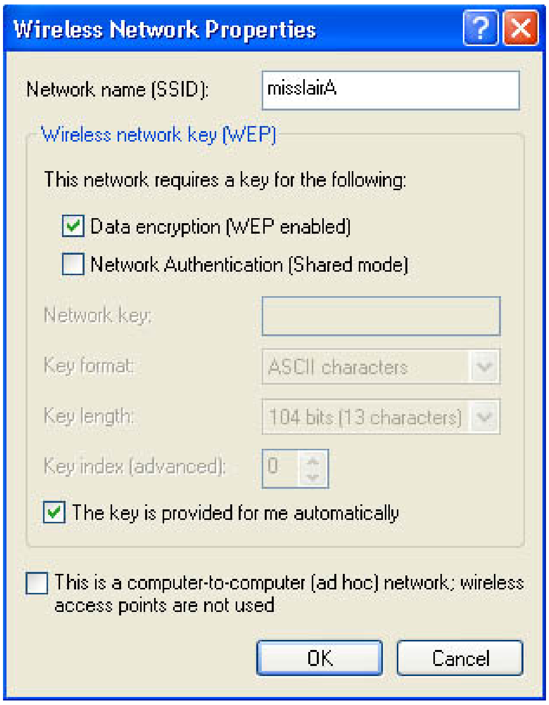
Automatically connect to available networks in the order listed below:

umd
misslairA

Learn about setting up wireless network configuration.

Figure 69: 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.



Wireless Network Properties

Network name (SSID): misslairA

Wireless network key (WEP)

This network requires a key for the following:

☑ Data encryption (WEP enabled)

□ Network Authentication (Shared mode)

Network key:

Key format: ASCII characters

Key length: 104 bits (13 characters)

Key index (advanced): 0

☑ The key is provided for me automatically

□ This is a computer-to-computer (ad hoc) network; wireless access points are not used

Figure 70: Properties Screen

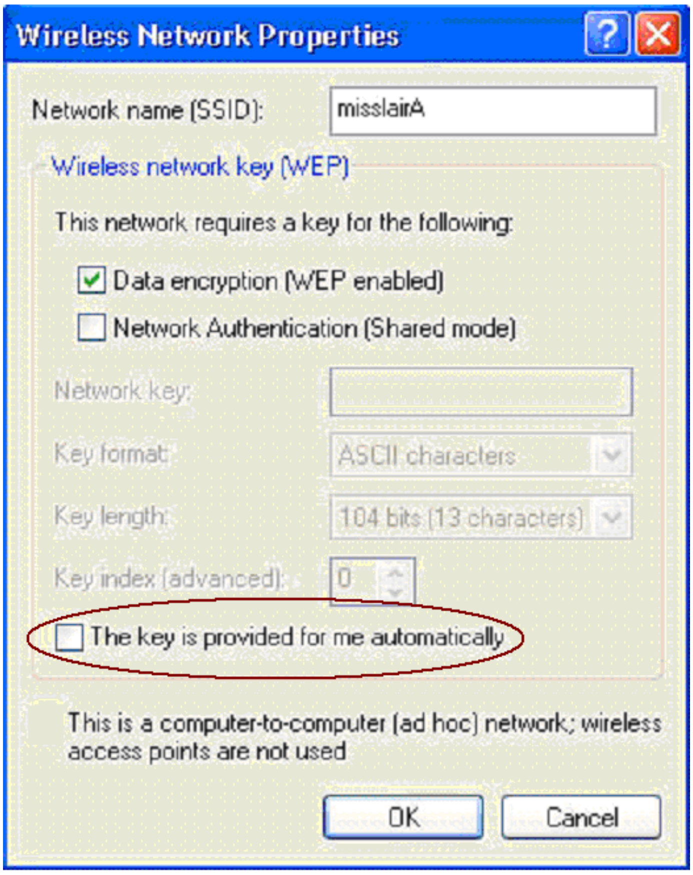
Setup for Windows XP and 802.1x client is now complete.

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.



Wireless Network Properties

Network name (SSID): misslairA

Wireless network key (WEP)

This network requires a key for the following:

☑ Data encryption (WEP enabled)

□ Network Authentication (Shared mode)

Network key:

Key format: ASCII characters

Key length: 104 bits (13 characters)

Key index (advanced): 0

□ The key is provided for me automatically

This is a computer-to-computer (ad hoc) network; wireless access points are not used

Figure 71: 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.

Regulatory Approvals

Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that

  to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Operations in the 5.15-5.25GHz band are restricted to indoor usage only.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 25cm between the radiator & your body.

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all WiFi product marketed in US must fixed to US operation channels only.

Industry Canada statement

This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Caution

(i) the device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

(ii) high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

Avertissement

les dispositifs fonctionnant dans la bande 5 150-5 250 MHz sont réservés uniquement pour une utilisation à l’intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;

(ii) De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu’ils ont la priorité) pour les bandes 5 250-5 350 MHz et 5 650-5 850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 25cm between the radiator & your body.

Déclaration d'exposition aux radiations

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 25 cm de distance entre la source de rayonnement et votre corps.