



Azalea Networks
Wireless Broadband
Anywhere Anytime

MSR SERIES WIRELESS MESH ROUTER

QUICK START GUIDE

AOS-v2.0

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Chapter 1

About this Guide

This chapter covers the following topics:

- [Scope](#)
- [Audience](#)
- [Related Documents](#)

Scope

This document provides a short tutorial that takes you through some of the basic steps of creating a Wireless Mesh Network using MSR series wireless mesh routers. The simplified instructions and examples use MSR series' Command Line Interface (CLI) and Web-based Management Interface (WMI). For more information on MSR series' configuration management, please refer to the CLI Configuration Guide and/or the Web-based Configuration Guide.

Note: The configuration examples and outputs are created with an MSR2000 router and is for demonstration purposes only. The exact output of the commands may vary depending on the router mode and its firmware version.

Audience

This document is intended for system/IT or network deployment engineer who is responsible for installing a new wireless mesh network using the MSR series, this guide assumed the user is knowledgeable in basic wireless/wired networking technologies and is comfortable with the use of a command-based interface.

Related Documents

For more information about MSR series, please refer to the following documents:

- MSR series Web-based Configuration Guide
- MSR series CLI Configuration Guide

Chapter 2 Introducing MSR series

The MSR series is a multi-function, wireless mesh router capable of forming a wireless network with end-user devices, other MSR series routers, and a wired network. The MSR series includes the following features:

1. Serving as a Wi-Fi Access Point (AP) for end-user devices such as laptops, PDAs, and Wi-Fi phones
2. Connecting to other MSR series routers to form the backbone of a wireless-mesh network
3. Connecting to a wired network via an Ethernet connection
4. Intelligent radio management, network routing, and client management/roaming functions

When the above functions are properly combined and configured, MSR series routers forms a wide-area wireless network that allows end-user devices located inside it to connect to the internet as well as each other, offering a diverse set of services such as web browsing, file sharing, VOIP, and video streaming. Users may roam freely within the network without experiencing any service interruption.

Sample Network

Figure 1 shows the topology of a typical network formed by the MSR series:

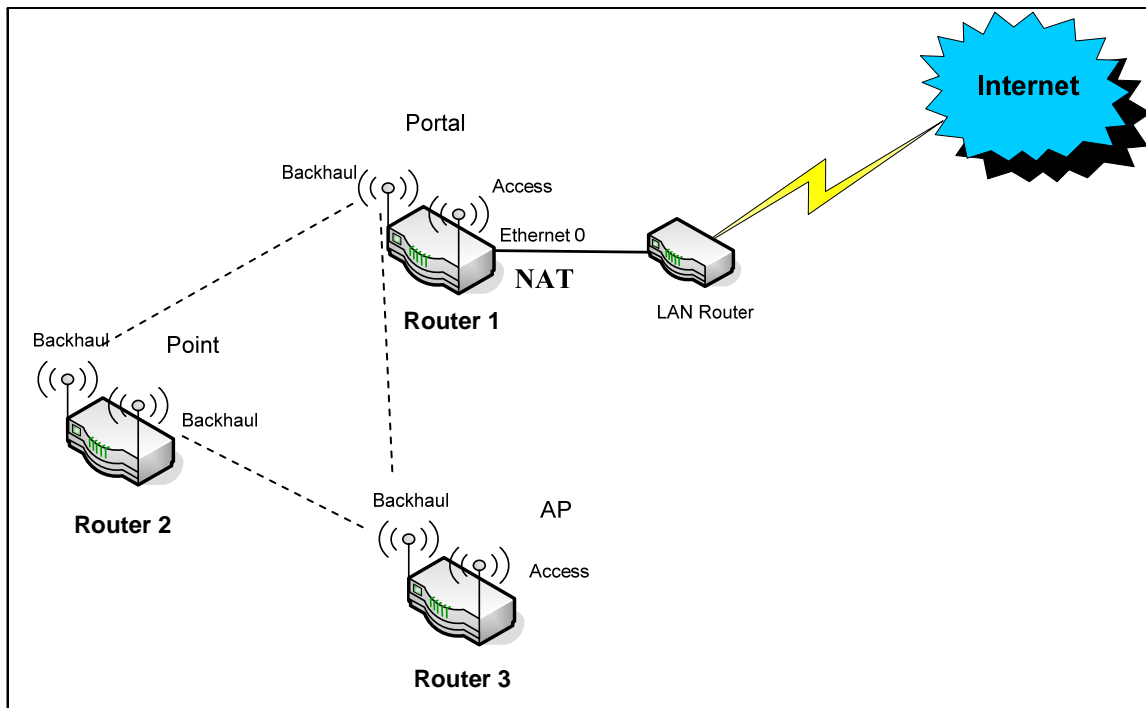


Figure 1 Sample MSR series Mesh Network

This network contains three MSR series routers (or nodes, as referred to hereon). Node 1 is referred to as a *portal node* because it has a direct, wired connection to the internet. It also contains two wireless connections formed by its two 802.11a/b/g radios. The first radio is configured in access mode, which means it services as one or more virtual

access points (AP) for end-user devices that might be around this node. In this example, the SSID for the virtual AP is “Public” and any client device that uses this SSID is connected to node 1. The other radio forms backhaul connections to the two other MSR series nodes, node 2 and node 3. The backhaul connections allow node 1 to send and receive network traffic to and from these other nodes, giving these other nodes an indirect connection to the internet.¹

Unlike node 1, node 2 does not serve any client devices but only forwards traffic to and from other nodes. As such, both of its radios are configured in backhaul mode. Such a relay-only node is known as a *point node*.

Node 3 is similar to node 1 in that it has one backhaul radio and one access radio, which means it is also capable of connecting to other MSR series routers and servicing client devices. However because it is not directly connected to a wired network, it is called an *AP node*.

Configuration Summary

Table 1 summarizes the basic configuration settings required for each of the three nodes:

Table 1 Node configuration summary

Name and Type	MSR2000_1 (Portal)	MSR2000_2 (Point)	MSR2000_3 (AP)
Node ID ²	1	2	3
Router ID ³	192.168.10.1	192.168.10.2	192.168.10.3
Ethernet-port IP/Mask ⁴	206.10.5.2/24	192.168.1.2/24	192.168.1.3/24
Ethernet Gateway ⁵	206.10.5.1	N/A	N/A
SSID for AP ⁶	Public	Not set	Public
DNS servers ⁷	206.10.10.12, 206.10.10.13	Not set	206.10.10.12, 206.10.10.13
Roaming (Motrix) ⁸	Enabled	Disabled	Enabled
NAT ⁹	Enabled	Disabled	Disabled

¹ The portal node presented in this quick start guide presents only one of many possible configurations of a portal node. The only requirement for a portal node is a wired connection; it may or may not have an access radio or provide virtual AP service. Please refer to the Configuration Guide for information on how to configure portal nodes differently.

² Node ID can be any integer 1 and 255, and must be unique within a single mesh network.

³ Router ID is an IPv4 loopback address that identifies the router, and is usually the best way to connect to the administration functions of an operational router; must be unique within a single mesh network.

⁴ This is the IP address and netmask of the Ethernet port 0 on the MSR series. Depending on the exact model, there may be one or two Ethernet ports. This quick start guide only uses Ethernet port 0.

⁵ This is the IP address of the gateway router that the Ethernet port 0 is connected to.

⁶ SSID is the alphanumeric identifier of a wireless AP which clients use to connect.

⁷ DNS server information is needed for the clients to connect to the internet; this information is passed to the client when the client uses the DHCP protocol to obtain an IP address from the AP on the MSR series.

⁸ Motrix-roaming is a service provided by the MSR series that allows wireless clients to move from the coverage area of one AP to another without experiencing any disruption in service. For details, refer to the Configuration Guide.

Chapter 3 Performing the Quick Start

There are two methods of performing the quick start configuration: using the Quick Setup Wizard provided by MSR series' Web-based Management Interface (WMI), or using the **setup** command of the router's Command Line Interface (CLI). Azalea recommends using the Quick Setup Wizard which is accessible from most modern internet browsers such as Internet Explorer. The Quick Setup Wizard simplifies the initial configuration of the router into answering a few simple questions.

Configuring nodes with the Quick Setup Wizard

The basic software requirement for the web-interface is:

- Web Browser: Internet Explorer 5.5 and above with Javascript enabled
- Optimal Resolution: 1024 X 768 and above

Accessing the Quick Setup Wizard

To access the WMI's Quick Setup Wizard, input the IP address of that router and the port:9080 in the address field of your web browser. On an un-configured MSR series router, you can connect a client PC to the router's Ethernet 0 port and use the port's default IP address of 192.168.0.1 to connect. A pop-up dialog box would appear and request a username and password (see Figure 2) The default username is 'root' and password is 'public'. After the successful authentication, the home page for WMI would appear (see Figure 3)



Figure 2 Logging into Web Management Interface (WMI)

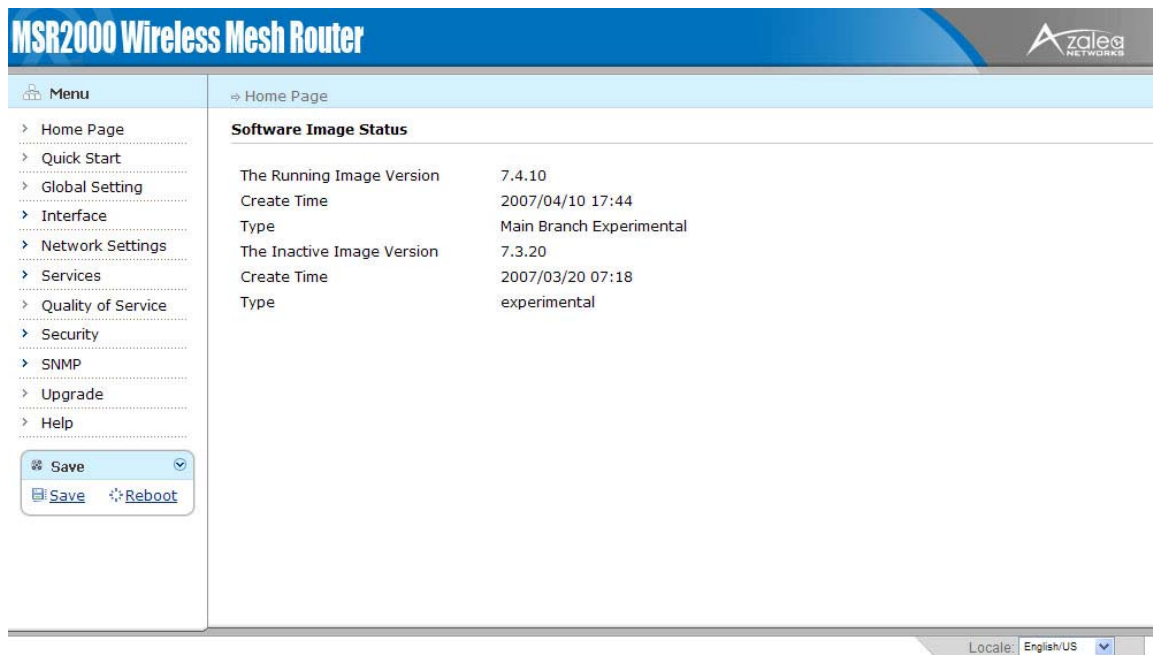


Figure 3 Web Management Interface Home Page

To open the Quick Setup Wizard, click the “Quick Setup” link in the left-side menu tree. The Step 1 of the Quick Setup Wizard appears at the right side of the web page (see Figure 4)

Node ID

Please choose an integer ID between 1 and 255 for this router; it should be different from all other routers that will be in the same mesh network as this one

<1-255>

Select role

Please select the role of this router within the mesh network:

- AP: provide access coverage
- Point: provide backbone connections in the network
- Portal: provide connection to the wired network and access coverage

▼

Figure 4 Web Management Interface Home Page

Using the Quick Setup Wizard

To configure a node with the Quick Setup Wizard, answer the questions asked during each step of the wizard. After entering the answers for all the questions at one step, click the “Next” button to go to the next step. The “Back” button could be used to return to the previous step, and clicking the “Finish” button at the end of the wizard completes the configuration.

Example Configuration 1: Portal node

The following figures show how the example portal node can be configured by answering the questions on each screen.

⇒ Quick Start Wizard

Step 1: Basic Settings

Node ID

Please choose an integer ID between 1 and 255 for this router; it should be different from all other routers that will be in the same mesh network as this one

<1-255>

Select role

Please select the role of this router within the mesh network

AP: provide access coverage

Point: provide backbone connections in the network

Portal: provide connection to the wired network and access coverage

Figure 5 Configuring the portal node, step 1

⇒ Quick Setup Wizard

Step 2: Networking Settings

Router ID

Please specify a loopback IP address for this router, it should be unique within the IP network

IPv4 Address

IP Address/Netmask

Please specify the IP address and Netmask for the FastEthernet 0 port of this router

☒ Static IP Address/Mask

Type:A.B.C.D/M

☐ Use DHCP to obtain the IP Address

Gateway

Please specify the IP address of the gateway that the FastEthernet 0 port is connected to

Type:A.B.C.D

NAT

Please choose whether NAT should be enabled on the FastEthernet 0 port

☒ Enable ☐ Disable

Figure 6 Configuring the portal node, step 2

⇒ Quick Setup Wizard

Step 3: Wireless Settings

BSS SSID
Please specify an SSID that can be used by wireless clients to access this router

DNS Server IP Address
Please specify a list of DNS addresses for the router Type:A.B.C.D,A.B.C.D...

Figure 7 Configuring the portal node, step 3

⇒ Quick Setup Wizard

Step 3: Wireless Settings

BSS SSID
Please specify an SSID that can be used by wireless clients to access this router

DNS Server IP Address
Please specify a list of DNS addresses for the router Type:A.B.C.D,A.B.C.D...

Windows Internet Explorer
To complete the quick setup, the router must be rebooted; please confirm.

Figure 8 Configuring the portal node, step 4

After the last step of confirming the reboot is performed, the web interface would stop responding for a few seconds while the router reboots itself. Note that since the quick setup changes the IP address of the Ethernet 0 port on the router, you may need to re-open the web interface using the new IP address if you were using Ethernet 0 to connect to the router.

Example Configuration 2: Point node

The following figures show how the example point node can be configured by answering the questions on each screen.

⇒ Quick Start Wizard

Step 1: Basic Settings

Node ID
Please choose an integer ID between 1 and 255 for this router; it should be different from all other routers that will be in the same mesh network as this one

<1-255>

Select role
Please select the role of this router within the mesh network
AP: provide access coverage
Point: provide backbone connections in the network
Portal: provide connection to the wired network and access coverage

Point ▼

Next

Figure 9 Configuring the point node, step 1

⇒ Quick Setup Wizard

Step 2: Networking Settings

Router ID
Please specify a loopback IP address for this router, it should be unique within the IP network

IPv4 Address

IP Address/Netmask
Please specify the IP address and Netmask for the FastEthernet 0 port of this router

☒ Static IP Address/Mask

Type:A.B.C.D/M

Back Finish

Figure 10 Configuring the point node, step 2

⇒ Quick Setup Wizard

Step 2: Networking Settings

Router ID
Please specify a loopback IP address for this router, it should be unique within the IP network

IPv4 Address

IP Address/Netmask
Please specify the IP address and Netmask for the FastEthernet 0 port of this router

☒ Static IP Address/Mask

Type:A.B.C.D/M

Windows Internet Explorer

To complete the quick setup, the router must be rebooted; please confirm.

OK Cancel

Figure 11 Configuring the point node, step 3

Example Configuration 3: AP node

The following figures show how the example AP node can be configured by answering the questions on each screen.

⇒ Quick Start Wizard

Step 1: Basic Settings

Node ID

Please choose an integer ID between 1 and 255 for this router; it should be different from all other routers that will be in the same mesh network as this one

<1-255>

Select role

Please select the role of this router within the mesh network:
 AP: provide access coverage
 Point: provide backbone connections in the network
 Portal: provide connection to the wired network and access coverage

AP ▼

Next

Figure 12 Configuring the AP node, step 1

⇒ Quick Setup Wizard

Step 2: Networking Settings

Router ID

Please specify a loopback IP address for this router, it should be unique within the IP network

192.168.10.3 IPv4 Address

IP Address/Netmask

Please specify the IP address and Netmask for the FastEthernet 0 port of this router

Static IP Address/Mask

192.168.1.3/24 Type:A.B.C.D/M

Back Next

Figure 13 Configuring the AP node, step 2

⇒ Quick Setup Wizard

Step 3: Wireless Settings

BSS SSID

Please specify an SSID that can be used by wireless clients to access this router

Public

DNS Server IP Address

Please specify a list of DNS addresses for the router

206.10.10.12,206.10.10.1 Type:A.B.C.D,A.B.C.D...

Back Finish

Figure 14 Configuring the AP node, step 3

Configuring nodes with the setup CLI command

In addition to using the Quick Setup Wizard, users may also perform the same configuration via the CLI's setup command. The MSR series' rich Command Line Interface (CLI) allows users to easily set up a new router as a portal, point, or AP node.

Connecting to the CLI Interface

An MSR series with the factory default configuration offers three methods of connecting to the CLI: via the serial-port console connection, via Ethernet port fast-Ethernet 0, or via the default wireless SSID.

Console Connection

The console connection is the most reliable method of accessing the MSR series' CLI configuration interface. This serial console port is for connecting a local management console and can be used to access CLI (Command Line Interface) to configure, manage and troubleshoot the router.

The MSR series router has a DB9 serial console port that is for connecting a terminal with a straight through cable. Use the communications settings in **Table 2** for connecting to a terminal.

Table 2 Console Settings

Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Ethernet Connection

The Ethernet connection is another method of accessing the MSR series router. At shipping time, the Ethernet port 0 (sometimes labeled as the WAN port) of the MSR series router has a default IP address **192.168.0.1/24**. A PC or laptop with a statically configured IP address may connect to this port via SSH and access the CLI to configure the router.

Note: The console and the Ethernet connections are the most secure methods of accessing the router CLI. Both methods require a username and a password. The default username is **root** and password is **public**.

Wireless Connection

The wireless connection is also a method of accessing the MSR series router. At shipping time, a default SSID "Azalea" is provided by the MSR series router. The configuration for this default BSS is shown in Table 3

Table 3 Default BSS Configuration

SSID	Azalea
802.11 mode	802.11b/g
Channel	1
Country Code	US
Authentication/Encryption	None
DHCP	Enabled

A wireless laptop may associate to this default BSS on the MSR series and obtain an IP address from MSR series' built-in DHCP server. Then, the CLI may be accessed by using SSH to connect to the IP address **172.16.1.1** and entering the default user name and password.

A note about Telnet

While MSR series do not offer telnet access at shipping time for security reasons, telnet service may be enabled through the CLI. To use telnet, please refer to the section "Telnet Client & Server" in the Configuration Guide.

Using the setup command

The MSR series CLI allows users to configure a router as a portal, point, or AP node via a single command called **setup**. To use this command, the user must first login into the CLI and enter the EXEC privileged mode.

Entering EXEC privileged mode via console

```
MSR2000 login: root
Password: public

Hello, Welcome to Azalea CLI

MSR2000> enable
MSR2000#
```

Entering EXEC privileged mode via SSH

```
#ssh root@192.168.0.1
root@192.168.0.1's password: public

Hello, Welcome to Azalea CLI

MSR2000> enable
MSR2000#
```

The **setup** command performs the basic configuration required for a MSR series router to function within a wireless-mesh network. After initial setup, one could always login into the CLI to re-setup the router or further customize individual settings via CLI commands. For more information, please refer to the configuration guide.

The overall syntax of the setup command is summarized in Table 4.

Table 4 Syntax of the Setup Command

Node Type	Setup Command Syntax
Point	setup point <country code> <node id> <router id> <eth0 port ip/mask>
AP	setup ap <country code> <node id> <router id> <eth0 port ip/mask> <ssid> <dns>
Portal	setup portal <country code> <node id> <router id> {<eth0 port ip/mask gateway IP> dhcp} <ssid> <dns> [nat-off]

The following three examples shows how each of the three routers introduced above are configured using the setup command. Note that by typing “?” after each parameter, one is reminded of the next parameter to enter. However, one could always perform the configuration by specifying the whole command in full.

Example Configuration 1: Portal node

```
MSR2000# setup portal ?
  AU  Set country code for Australia
  CN  Set country code for China
  EU  Set country code for Denmark, Germany, Iceland, Finland,
Netherlands, Norway, Sweden, Poland, Slovenia, Luxembourg, South Africa
  IL  Set country code for Israel
  JP  Set country code for Japan
  KR  Set country code for Korea
  LA  Set country code for Latin America
  NA  Set country code for North America (USA and Canada)
  SG  Set country code for Singapore
  TW  Set country code for Taiwan
  US  Set country code for US

MSR2000# setup portal US ?
  <1-255> The node-id of this router
MSR2000# setup portal US 1 ?
  A.B.C.D The router loopback id
MSR2000# setup portal US 1 192.168.10.1 ?
  dhcp      Use DHCP for fast-ethernet 0
  A.B.C.D/M The static IP address/prefix of fast-ethernet 0
MSR2000# setup portal US 1 192.168.10.1 206.10.5.2/24 ?
  A.B.C.D IP address of default gateway
MSR2000# setup portal US 1 192.168.10.1 206.10.5.2/24 206.10.5.1 ?
  WORD SSID of this router's BSS
MSR2000# setup portal US 1 192.168.10.1 206.10.5.2/24 206.10.5.1
Public ?
  WORD A.B.C.D DNS Server IP address (ip_address,ip_address,...)
MSR2000# setup portal US 1 192.168.10.1 206.10.5.2/24 206.10.5.1 Public
206.10.10.12,206.10.10.13 ?
  nat-off Do not use NAT on fast-ethernet 0
  <cr>
MSR2000# setup portal US 1 192.168.10.1 206.10.5.2/24 206.10.5.1 Public
206.10.10.12,206.10.10.13 <cr>
Overwrite current configuration with new settings and reboot?(yes/no)
yes
```

After confirming the setup, the router will reboot and start functioning as a portal node.

Example Configuration 2: Point node

```
MSR2000# setup point ?
  AU  Set country code for Australia
  CN  Set country code for China
  EU  Set country code for Denmark, Germany, Iceland, Finland,
Netherlands, Norway, Sweden, Poland, Slovenia, Luxembourg, South Africa
  IL  Set country code for Israel
  JP  Set country code for Japan
  KR  Set country code for Korea
  LA  Set country code for Latin America
```



```

NA Set country code for North America (USA and Canada)
SG Set country code for Singapore
TW Set country code for Taiwan
US Set country code for US
MSR2000# setup point US ?
<1-255> The node-id of this router
MSR2000# setup point US 2 ?
A.B.C.D The router loopback id
MSR2000_1# setup point US 2 192.168.10.2 ?
A.B.C.D/M The static IP address/prefix of fast-ethernet 0
MSR2000# setup point US 2 192.168.10.2 192.168.1.2/24 ?
<cr>
MSR2000# setup point US 2 192.168.10.2 192.168.1.2/24 <cr>
Overwrite current configuration with new settings and reboot?(yes/no)
yes

```

After confirming the setup, the router will reboot and start functioning as a point node.

Example Configuration 3: AP node

```

MSR2000# setup ap ?
AU Set country code for Australia
CN Set country code for China
EU Set country code for Denmark, Germany, Iceland, Finland,
Netherlands, Norway, Sweden, Poland, Slovenia, Luxembourg, South Africa
IL Set country code for Israel
JP Set country code for Japan
KR Set country code for Korea
LA Set country code for Latin America
NA Set country code for North America (USA and Canada)
SG Set country code for Singapore
TW Set country code for Taiwan
US Set country code for US
MSR2000# setup ap US ?
<1-255> The node-id of this router
MSR2000# setup ap US 3 ?
A.B.C.D The router loopback id
MSR2000# setup ap US 3 192.168.10.3 ?
A.B.C.D/M The static IP address/prefix of fast-ethernet 0
MSR2000# setup ap US 3 192.168.10.3 192.168.1.3/24
WORD SSID of this router's BSS
MSR2000# setup ap US 3 192.168.10.3 192.168.1.3/24 Public
WORD A.B.C.D DNS Server IP address (ip_address,ip_address,...)
MSR2000# setup ap US 3 192.168.10.3 192.168.1.3/24 Public
206.10.10.12,206.10.10.13 ?
<cr>
MSR2000# setup ap US 3 192.168.10.3 192.168.1.3/24 Public
206.10.10.12,206.10.10.13 <cr>
Overwrite current configuration with new settings and reboot?(yes/no)
yes

```

After confirming the setup, the router will reboot and start functioning as an AP node.

Once all three nodes are setup, they will automatically discover each other and form a wireless mesh network. Since both router 1 and router 3 have an AP, clients may associate to these routers and access the internet through the portal router 1.

Note: The above setup does not require users to manually setup any link-level configuration because it uses MSR series' radio management to automatically discover other nodes and form the network. This feature makes it easy to set up wireless mesh networks; however, it does not allow a fine-grained control of the wireless links, nor does it guarantee the formulation of a fully-connected and converged network every time the routers boots up. If full control of the wireless links and stable convergence of the network is desired, please see Appendix C, manual configuration of wireless links.

Configurations performed by the Quick Start Procedure

The Quick Start procedures described above allow quick configurations of the MSR series without the user having to configure each setting individually. The “**show running-config**” command can be used to display the configuration performed by the quick start procedure. Furthermore, the WMI and CLI interfaces offered by the MSR series contain many more settings. Please refer to the Configuration Guide for details.

Here are the configurations performed by the setup command for the three example nodes:

Node 1: Portal node

```
MSR2000_1# show running-config
hostname MSR2000_1
!
node-id 1
router-id 192.168.10.1
country-code US
!
!
!
!
ip route 0.0.0.0/0 206.10.5.1
!
!
interface dot11radio 0
 wireless-mode g 1
 mode access
 bss Public
  dhcp server automatic
!
interface dot11radio 1
 wireless-mode a 36
 mode backhaul
 wds auto
!
interface fast-ethernet 0
 ip address 206.10.5.2/24
 mode gateway
!
interface fast-ethernet 1
 shutdown
!
!
ip dhcp server
 enable
```

```

dns 206.10.10.12,206.10.10.13
!
!
ip dhcp relay
  disable
!
service recovery
  enable
!
router awr
  enable
  debug error
!
!
service rf-management
  debug error
!
!
service roaming-motrix
  enable
  debug information
!
!
ip nat
  enable
  out-interface fast-ethernet 0
!
snmp-server community public ro
snmp-server community private rw
!
qos
  disable
  class DEFAULT
    maxbw 300
    minbw 50
!

```

Node 2: Point node

```

MSR2000_2# show running-config
hostname MSR2000_2
!
node-id 2
router-id 192.168.10.2
country-code US
!
!
!
!
interface dot11radio 0
  wireless-mode a 36
  mode backhaul
  wds auto
!
interface dot11radio 1
  wireless-mode a 36

```

```

mode backhaul
wds auto
!
interface fast-ethernet 0
ip address 192.168.1.2/24
!
interface fast-ethernet 1
shutdown
!
!
ip dhcp server
disable
!
!
ip dhcp relay
disable
!
service recovery
enable
!
router awr
enable
debug error
!
!
service rf-management
debug error
!
!
service roaming-motrix
disable
debug information
!
snmp-server community public ro
snmp-server community private rw
!
qos
disable
class DEFAULT
maxbw 300
minbw 50
!

```

Node 3: AP node

```

MSR2000_3# show running-config
hostname MSR2000_3
!
node-id 3
router-id 192.168.10.3
country-code US
!
!
!
!
!

```

```

interface dot11radio 0
wireless-mode g 1
mode access
bss Public
dhcp server automatic
!
interface dot11radio 1
wireless-mode a 36
mode backhaul
wds auto
!
interface fast-ethernet 0
ip address 192.168.1.3/24
!
interface fast-ethernet 1
shutdown
!
!
ip dhcp server
enable
dns 206.10.10.12,206.10.10.13
!
!
ip dhcp relay
disable
!
service recovery
enable
!
router awr
enable
debug error
!
!
service rf-management
debug error
!
!
service roaming-motrix
enable
debug information
!
snmp-server community public ro
snmp-server community private rw
!
qos
disable
class DEFAULT
maxbw 300
minbw 50
!

```

Portal Routers without NAT

If NAT is disabled on the portal router, more configurations are needed for the wired-network router (hereby referred to as the LAN router) to which the portal router is connected. The configuration requires extensive knowledge of network routing and is not recommended for novice users. Therefore, disabling NAT is only recommended for advanced network administrators who need a finer control of their network topology.

To allow in-bound and out-bound traffic to properly flow between the portal node and the LAN router, the routing table on the LAN router must contain all routes known by the portal node. This information can be obtained via the “**show ip route**” command on the portal node.

After initial configuration and reboot of the portal node, allow a few minutes for the node to learn the routes to all the nodes within the network. Then log into the CLI's EXEC privilege mode of the router and enter “**show ip route**”

Sample result of “show ip route”

```
MSR2000_1# show ip route
Codes: K - kernel route, C - connected, S - static, H - host,
       A - AWR, > - selected route, * - FIB route

S>* 0.0.0.0/0 [1/0] via 192.168.0.1, fast-ethernet 0
H   192.168.10.1/32 [0/0] is directly connected, lo:2
C>* 192.168.10.1/32 is directly connected, lo:2
C>* 172.16.1.0/24 is directly connected, Dot11Radio0
H>* 172.16.1.1/32 [0/0] is directly connected, Dot11Radio0
C>* 200.1.2.0/24 is directly connected, RadiolAWds0
H>* 200.1.2.1/32 [0/0] is directly connected, RadiolAWds0
C>* 200.1.3.0/24 is directly connected, RadiolAWds1
H>* 200.1.3.1/32 [0/0] is directly connected, RadiolAWds1
C>* 192.168.1.0/24 is directly connected, fast-ethernet 0
H>* 192.168.1.1/32 [0/0] is directly connected, fast-ethernet 0
```

Other than the default route, all the other routes should be added to the routing table of the LAN router via its own CLI or some other configuration interface.

Manual Link Configuration

The setup described in the previous sections relies on MSR series' radio management intelligence to automatically discover other nodes and form the mesh network. While this feature reduces the amount of work to set up a mesh network, it prevents users from controlling the configuration of the backhaul wireless links. In addition, automatic mesh-forming cannot guarantee full mesh connectivity or stable convergence. To solve this problem, it is recommended for one to set up the backhaul links manually using the instructions in this appendix.

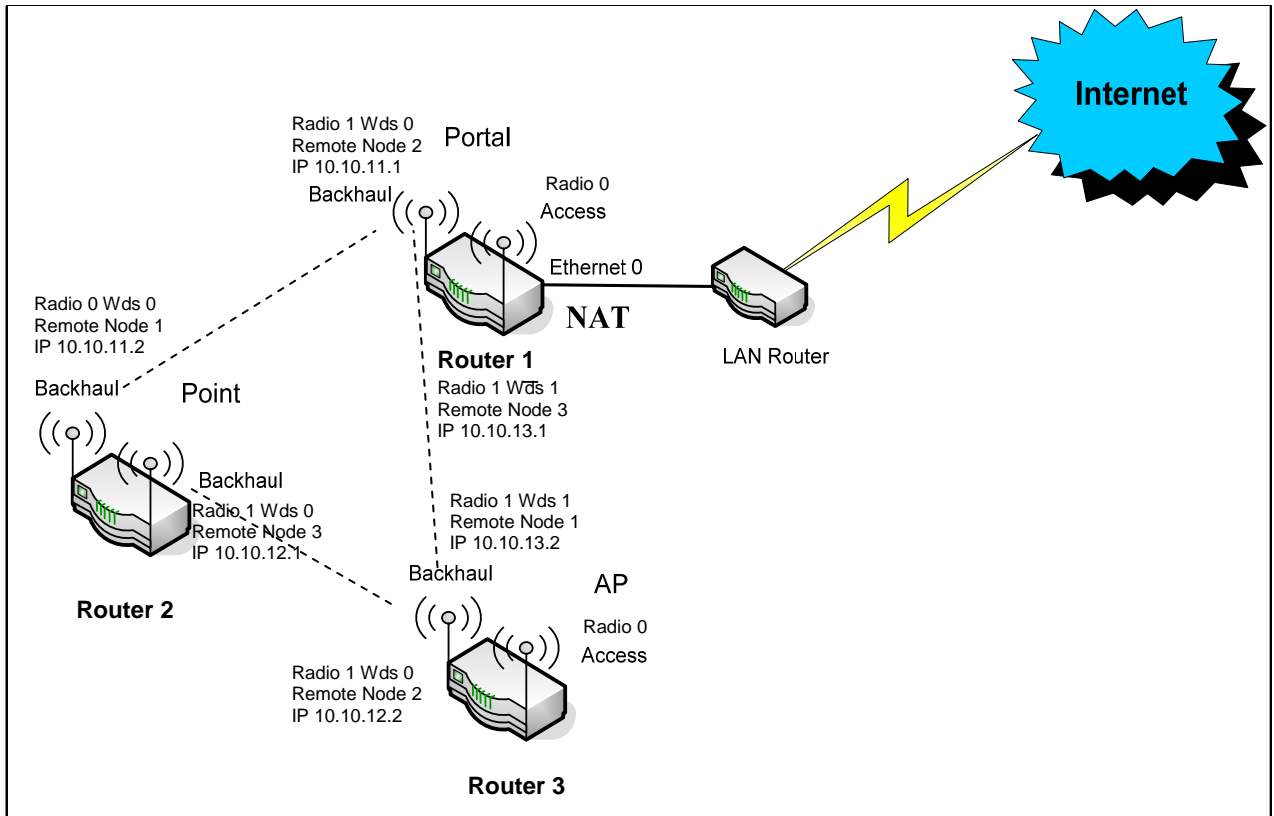


Figure 15 Sample MSR series Mesh Network with Manual Configuration

The MSR series system uses the Wireless Distribution System (WDS) technology to form its backhaul wireless connectivity using WDS links. In the topology presented by Figure 15, there is a WDS link between node 1 and node 2, between node 1 and node 3, and between node 2 and node 3.

Each MSR series has two radios, 0 and 1, which may operate in either backhaul or access mode. WDS links must be configured on a radio that is configured for backhaul mode for the links to take effect. In our example topology, both node 1 and node 3 have radio 0 in access mode and radio 1 in backhaul mode, the same as factory default setting. Node 2 has both radios 0 and 1 in backhaul mode. There is a link between radio 1 of node 1 and radio 0 of node 2, a link between radio 1 of node 2 and radio 1 of node 3, and a link between radio 1 of node 1 and radio 1 of node 3 (one radio may support multiple WDS links).

WDS links may be manually configured between two routers by configuring manual WDS interfaces on each router by specifying the ID of the node at the other end of the link (known as the “Remote Node”). Therefore, the nodes at the two ends of a link will have their “remote node” set to each other.

Besides the remote node, one must also assign a unique IP address for each WDS interface within the network. Because WDS is a point-to-point link, the WDS interface at the two ends of a WDS link must be on the same IP subnet using different IP addresses. The WDS interfaces belonging to different WDS links must be on different IP subnets.

Table 5 captures the manual configurations needed to set up our example mesh network:

Table 5 Manual WDS Configuration

Node	Interface	Remote Node	IP Address/Mask
MSR2000_1	Radio 1 Wds 0	2	10.10.11.1/24
	Radio 1 Wds 1	3	10.10.13.1/24
MSR2000_2	Radio 0 Wds 0	1	10.10.11.2/24
	Radio 1 Wds 0	3	10.10.12.1/24
MSR2000_3	Radio 1 Wds 0	2	10.10.12.2/24
	Radio 1 Wds 1	1	10.10.13.2/24

The following section describes the CLI commands needed to complete the configuration for each of the three nodes; *they should be used after the initial setup steps described in the main section has been followed:*

Portal Node MSR2000_1:

```
MSR2000_1# config terminal
MSR2000_1(config)# interface dot11radio 1
MSR2000_1(config-if-dot11radio)# no auto wds
MSR2000_1(config-if-dot11radio)# wds 0
MSR2000_1(config-if-dot11radio-wds)# remote node 2 0
MSR2000_1(config-if-dot11radio-wds)# ip address 10.10.11.1/24
MSR2000_1(config-if-dot11radio-wds)# quit
MSR2000_1(config-if-dot11radio)# wds 1
MSR2000_1(config-if-dot11radio-wds)# remote node 3 1
MSR2000_1(config-if-dot11radio-wds)# ip address 10.10.13.1/24
MSR2000_1(config-if-dot11radio-wds)# end
MSR2000_1# write mem10
```

Point Node MSR2000_2:

```
MSR2000_2# config terminal
MSR2000_2(config)# interface dot11radio 0
MSR2000_2(config-if-dot11radio)# no auto wds
MSR2000_2(config-if-dot11radio)# wds 0
MSR2000_2(config-if-dot11radio-wds)# remote node 1 1
MSR2000_2(config-if-dot11radio-wds)# ip address 10.10.11.2/24
MSR2000_2(config-if-dot11radio-wds)# quit
MSR2000_2(config-if-dot11radio)# quit
MSR2000_2(config)# interface dot11radio 1
MSR2000_2(config-if-dot11radio)# no auto wds
MSR2000_2(config-if-dot11radio)# wds 0
MSR2000_2(config-if-dot11radio-wds)# remote node 3 1
MSR2000_2(config-if-dot11radio-wds)# ip address 10.10.12.1/24
MSR2000_2(config-if-dot11radio-wds)# end
MSR2000_2# write mem
```

AP Node MSR2000_3:

```
MSR2000_3# config terminal
MSR2000_3(config)# interface dot11radio 1
```

¹⁰ The “Write Mem” command saves the configuration changes so they will be persistent after each reboot.


```
MSR2000_3(config-if-dot11radio)# no auto wds
MSR2000_3(config-if-dot11radio)# wds 0
MSR2000_3(config-if-dot11radio-wds)# remote node 2 1
MSR2000_3(config-if-dot11radio-wds)# ip address 10.10.12.2/24
MSR2000_3(config-if-dot11radio-wds)# quit
MSR2000_3(config-if-dot11radio)# wds 1
MSR2000_3(config-if-dot11radio-wds)# remote node 1 1
MSR2000_3(config-if-dot11radio-wds)# ip address 10.10.13.2/24
MSR2000_3(config-if-dot11radio-wds)# end
MSR2000_3# write mem
```

Chapter 4 Factory Default Configuration

When each MSR series is shipped, it is preloaded with a factory default configuration. Table 6 outlines the factory default value for some of the important parameters.

Table 6 Syntax of the Setup Command

Setting	Factory Default Value
Password	public
Country Code	US
Node ID	1
Router ID	192.168.10.1
Fast Ethernet 0	192.168.0.1/24
Fast Ethernet 1 ¹¹	Disabled
SSID for AP	Azalea
Roaming	Enabled
NAT	Enabled

The following section shows the full factory default configuration as presented by the “**show running-config**” command:

```
MSR2000# show running-config
hostname MSR2000
!
node-id 1
router-id 192.168.10.1
country-code US
!
!
!
!
interface dot11radio 0
 wireless-mode g 1
 mode access
 bss Azalea
 dhcp server automatic
!
interface dot11radio 1
 wireless-mode a 36
 mode backhaul
 wds auto
!
interface fast-ethernet 0
 ip address 192.168.0.1/24
!
interface fast-ethernet 1
 shutdown
!
!
ip dhcp server
 enable
```

¹¹ Ethernet port 1 is not available on some MSR series models.

```
!  
!  
ip dhcp relay  
    disable  
!  
service recovery  
    enable  
!  
router awr  
    enable  
    debug error  
!  
!  
service rf-management  
    debug error  
!  
!  
service roaming-motrix  
    enable  
    debug information  
!  
!  
ip nat  
    enable  
    out-interface fast-ethernet 0  
!  
snmp-server community public ro  
snmp-server community private rw  
!  
qos  
    disable  
    class DEFAULT  
        maxbw 300  
        minbw 50  
!
```

Restoring the factory default configuration

The factory default configuration could be restored via the “**setup factory**” command:

```
MSR2000# setup factory  
Restore configuration to factory default and reboot? (Yes/No) yes
```

After confirming the setup, the router will reboot into the factory default configuration.