

[WiNG 5.1] How-To Guide [Client Load Balancing and Smart Band Control]

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1. Introduction:

1.1 Overview:

Loads are balanced by ignoring association and probe requests. In other words, probe requests and association requests are not responded to, forcing the clients to associate with another radio or AP. This behavior is enabled on a per-wlan basis by means of a configurable item. Enabling it on a per- wlan basis, allows us to make clients on some wlan's non-load balanced, which might be useful in certain scenarios.

Loads are balanced on <u>individual WLAN Profiles</u> and across all AP's that are broadcasting the profile's ESSID. Client probe requests and association requests made to the ESSID are answered by AP's that meet frequency band and load requirements set by the WLAN administrator. Client Load Balancing enables individual ESSID's to distribute clients to increase bandwidth and assist in alleviating band interference. Load and Band Steering Capabilities are configured in the Wireless LAN Profile on the GUI and CLI.

2. Theory of Operation:

Definitions:

- Client Load Balancing (CLB) Balancing clients across APs based on the relative loading of APs.
- Smart Band Control (SBC) Detect dual band wireless clients and load balance them across the 2.4GHz and 5 GHz bands based on the weights set by the administrator. The common use case is to put more wireless clients on to the 5 GHz band.
- **Loads-** The number of users on an AP and the number of users on a particular frequency band/channel and throughput generated across the WLAN (ESSID) according to configured parameters.

Client Load Balancing balances:

1. Loads per AP in a neighborhood:

Each AP monitors and attempts to equalize its total load with those of the APs in its neighborhood.



2 Clients on Each AP

2. Loads per channel per band in a neighborhood:

Each AP attempts to evenly distribute its load across the channels of each of the bands in its neighborhood. For example; dual radio AP #1, might be on channel 11 and channel 36. Its neighbors are on channel 1, 11, and channel 44, 48, AP# 1 would attempt to equalize the load on channels 1 and 11 in the 2.4 GHz band, and on channels 36, 44, 48 on the 5 GHz band. AP#1 would do this by rejecting clients if the load on channel 11 is a lot higher than channel 1 or readily accepting clients if the load on channel 1 is higher.



2 Clients on Ch11 and 1 Client on Ch6 3 Clients evenly distributed across Ch 36,44,48

3. Loads between bands in a neighborhood:

Each AP attempts to load the 2.4 GHz band and the 5 GHz band in a ratio that is configurable. For example, if the total load in the 2.4ghz band in a wireless neighborhood is 4 times the total load in the 5ghz band and the ratio was specified as 3:1, then AP's would ignore client requests in the 2.4Ghz band until the ratio came down to 3 times.



6 Clients on 2.4 Ghz / 3 Clients on 5 Ghz

2.1 The Client Load Balancing setup pages in the Controller GUI.

There are 3 relevant pages to configure and view Client Load Balancing (CLB)

1. WLAN Client Load Balancing Configuration:

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Advanced	Probe Request Interval	10 Seconds V (0 to 10,000)	
	Band Discovery Interval	10 Seconds V (0 to 10,000)	
	Load Balancing Settings (5GHz) —		
	Single Band Clients	\checkmark	
	Max Probe Requests	60 (0 to 10,000)	
	Probe Request Interval	10 Seconds V (0 to 10,000)	
	Capability Ageout Time	1 Hours (0 to 2)	
-	~		
▶			
			OK _x Reset _x Exit
Event Summary 000		Find Functional Area	Type to search

Figure 1

• This page contains all the parameters that are set on a per-WLAN basis:

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Device ap7131-0B8634	(00-23-68-0B-86-34) Type ap71xx	Profile N	lame default-ap7131 🛛 😮
Basic Configuration	Client Load Balancing		
Certificates	Balance AP Loads	\checkmark	
🔻 RF Domain Overrides	Min. Value to Trigger Balancing	5 (0 to 100 percent)	
RF Domain	Balance Band Loads by Ratio	\checkmark	
Sensor Configuration	Band Ratio (2.4GHz)	1 (0 to 10)	
WLAN Override	Band Ratio (5GHz)	1 (0 to 10)	
General	Balance 2 4GHz Channel Loads		
Power	Min. Value to Trigger 2.4GHz Channel Balancing	5 (0 to 100 percent)	
Adoption	Balance 5GHz Channel Loads		
▶ Interface	Min. Value to Trigger 5GHz Channel Balancing	(0 to 100 percept)	
▶ Network	······································		
▶ Security	AP Load Calculation		
Services	Weightage given to Throughput	10 (0 to 100 percent)	
▶ Management	Weightage given to Client Count	90 (0 to 100 percent)	
Advanced	2.4GHz Load Calculation		
Client Load Balancing	Weightage given to Throughput	10 (0 to 100 percent)	
MINT Protocol	Weightage given to Client Count	90 (0 to 100 percent)	
Miscellaneous	FCHz Load Calculation		
	Weightage given to Throughput	10 (0 to 100 percept)	
	Weightage given to Client Count		
	weightage given to client count		
	Comparing Loads		
	Max. AP Load Difference Considered Equal	1 (0 to 100 percent)	
	Max. Band Load Difference Considered Equal	1 (0 to 100 percent)	
	Max. 2.4GHz Load Difference Considered Equal	1 (0 to 100 percent)	
	Max. 5GHz Load Difference Considered Equal	1 (0 to 100 percent)	
			OK _x Reset _x Exit
Event Summary 0 0 0		Find Functional Are	a Type to search

2. AP Client Load Balancing Configuration

Figure 2

• This page contains the entire CLB configuration that is not WLAN-specific.

3. Client Load Balancing Stats

 This page is the main thrust of this discussion and will be discussed in the sections to follow.





Understanding the CLB Statistics GUI

Figure 3

2.1.1 The Individual Parts

- **Note**: In the descriptions below the "load" is always a weighted sum of the throughput and MU count, as specified in configuration, unless it is specifically called "client count load" or "traffic load".
- **Note**: All the bar graphs are updated every minute, but only if the slider is at the '0' or "current value" position. The load balancing graph is always updated every minute, regardless of the position of the slider.
- **Tip:** Performing a mouse-over on any graph will give you the instantaneous value of that graph.
- 1. Load Balancing Graph: This line graph displays 5 values as measured by the AP over the past 60 minutes:
 - 1. AP Load: The loading on the AP itself as a percentage.
 - 2. 2.4 Ghz Load: The load on the 2.4 GHz band in the neighborhood as a percentage.

- 3. 5. GHz Load: The load on the 5 GHz band in the neighborhood as a percentage.
- 4. 2.4 Ghz Channel Load: The load on the 2.4 GHz channel that the AP has a radio on. This may include the load contributed to that channel by other neighbors.
- 5. 5 GHz Channel Load: The load on the 5 GHz channel that the AP has a radio on. This may include the load contributed to that channel by other neighbors.
- 2. Neighbor Loads Graph: This bar graph displays the instantaneous values of the neighbor loads at the time pointed to by the slider. It shows the following values for each neighbor:
 - 1. 2.4GHz load: The load contributed to the 2.4 GHz band by that neighbor.
 - 2. 5GHz load: The load contributed to the 5 GHz band by that neighbor.
 - 3. Composite load: The loading on that neighbor.
 - 4. A mouse-over one any of the bars will give you the specific value and the channel information.
- 3. 2.4 GHz Channel Loads: This bar graph displays the instantaneous values of the channel loads at the time pointed to by the slider. It shows the following values for each channel in the neighborhood:
 - 1. Client Load: The client count load on that channel.
 - 2. Traffic Load: The traffic load on that channel.
 - 3. Composite Load: The load on that channel.
- 4. 5GHz Channel Loads: This bar graph displays the instantaneous values of the channel loads at the time pointed to by the slider. It shows the following values for each channel in the neighborhood:
 - 1. Client Load: The client count load on that channel.
 - 2. Traffic Load: The traffic load on that channel.
 - 3. Composite Load: The load on that channel.
- 5. Client Request Events: This is a table of events in time that gives us the following information:
 - 1. Mac address of the client.
 - 2. The time when a client attempted to associated.
 - 3. The result of that request allowed or denied.
 - 4. The reason for the result. Clients are usually denied because their band capabilities are being discovered, or the load on that channel/band/AP is too high. Clients are allowed when the loads are within bounds, or when they are deemed desperate.
 - 5. The WLAN where the client made the request.
 - 6. The channel on which the client made the request.
 - 7. The capability of the client.
- 6. The Slider: This is the main control on the page. The bar graphs and the event table will display values corresponding to the time specified by the slider's location.

7. The "Load Balancing Configuration gear": This is located on the top right corner of the Load Balancing Graph and expands to what is shown below:



Figure 4

- The AP Overload switch goes "open circuit" (or blocking requests) if the AP load is greater than the average load in the neighborhood. In this case, both radios on this AP will refuse further associations until the AP load is comparable to the average load.
- The AP Overload Switch goes "closed circuited" (or allowing requests), when the AP load is comparable to the average load. In this case, we proceed to the next comparison.
- The current band ratio is compared to the configured band ratio. If the 5 GHz band load is deemed too high compared with the 2.4 GHz band load, the "5Ghz Overload" switch goes "open circuit" (blocking requests). This means that all further requests on the 5 GHz radio will be denied, until the ratio becomes comparable. The "2.4GHz Overload" switch goes "closed circuit" (allowing requests), so the ratio can adjust to become closer to the configured ratio.
- The "5GHz Channel Overload" switch goes "open circuit" (blocking requests) when the channel load on this AP's 5Ghz channel is greater than the average 5Ghz channel load in the neighborhood.
- The same applies to the "2.4GHz Channel Overload" switch.
- Keep in mind that the instantaneous state of all these switches will correspond to the time pointed to by the slider.

3. How to Configure Load Balancing

3.1 Pre-Requisites:

- 1. Windows 2008 server Enterprise or Existing LAN infrastructure for client data transactions
- 2. Network should be up and running

3.1.1 Requirements:

The following requirements must be met prior to attempting this configuration:

- 2 or more AP7131N 802.11n Access Points installed and configured
- RSF Switch installed and running WiNG 5.1 or greater
- One (or more) wireless workstations are available to operation.
- The reader has read the Motorola RFS Series Wireless LAN Switches WiNG System Reference Guide.

3.1.1.1 Components Used:

The information in this document is based on the following Motorola hardware and software versions:

- RFS4000
- AP7131N
- Registered users may download the latest software and firmware from the Motorola Technical Support Site <u>http://support.symbol.com</u>.

3.1.1.2 Configurable Items

- Client load balancing enable/disable on a per-wlan basis.
- Allow single-band clients.
- Persistence threshold in probe requests per minute.
- Weightage given to client count and throughput in calculating load.
- Ratio in which the bands are to be loaded.
- Min threshold for total-ap-loading, total-band-loading, and total-channel- loading for each hand

3.2 Enable Client Load Balancing

3.2.1 Command Line Interface:

In the CLI issue the "client-load-balancing" command <Enter>
- Enables client load balancing on this wlan "RFS4000"

login as: admin admin@192.168.2.100's password: rfs4000-22D070>en rfs4000-22D070#configure terminal Enter configuration commands, one per line. End with CNTL/Z. rfs4000-22D070(config)#wlan MD-RSF4000 rfs4000-22D070(config-wlan-MD-RSF4000)#client-load-balancing rfs4000-22D070(config-wlan-MD-RSF4000)#commit write

3.2.1.1 Showing the state:

- 1) rfs4000-22D070# show wireless ap load-balancing
- Show the load-balancing state and stats
- Example output:

!

Telnet 192.	168.1.2												
rfs4000-221 Column Na Aug-Ld 2.4g-Ld 5g-Ld Ap-2.4g-L Ap-2.4g-1 Ap-5g-Ch Aug-5g-Cl Allow-2.4 Allow-5g	D070#show wireless ame Reference: E Load of Average 2.4GHz 5GHz ba Ch-Ld : Load in -Ch-Ld : Average -Ld : Load in h-Ld : Average 4g-Req : AP resp -Req : AP resp	ap load-b the AP a AP load band load i the AP's load of the AP's load of onds to c	as repor in the f in the f in the A 2.4GHz 3.4GHz 3.5GHz d 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.	g on rfs AP's nei AP's neig Channel z channel i channel i channel equests equests	4000-22D t. ghborhoo ighborhoo in its 1 in AP' n its ne in AP's on 2.4gh on 5ghz	0070 od. 1. neighbor s neighbor neighbor neighbor nz radio radio	hood . orhood . od . hood .						
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1	rfs4000-22D070	0%	0%	0%	0%	0:0	1:1	0%	0%	0%	0%	yes	yes
rfs4000-221	D070#												

3.2.3 GUI

- 1) On your browser <u>https://controllerip</u>
 - a. Enter User name
 - b. Enter Password



Figure 5

2) Go to:

- a. Configuration
- b. Wireless
- c. Select the WLAN for Load Balancingd. Select "Edit" at the bottom right hand corner

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Figure 6

3) On the Wireless LAN Screen

- a. Select "Client Load Balancing"
- b. in the "Load Balancing Settings" window; click "Enable Client Load Balancing"
- c. Click "OK" on the bottom right side
- d. Click "Commit" "Save" at the top right

You must click "Commit" and "Save" as this rights the change to the running-config and saves to startup-config/memory

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Figure 7

3.3.1 Configuring CLB from the Circuit:

1. Clicking on any switch in the circuit will pop up the relevant configuration items as shown in the diagram below.



Figure 8

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😵 Health	Load Balancing								
Inventory Inventory Device Deprade AP Upgrade AP Detection Wireless Clients Wireless LANs Network Interfaces Interfaces Power Status Network	AP Load 2.4GHz Load(2) SGHz Load(3) Channel Channel								
Certificates	-60 -50 -10 0								

Figure 9

- Notice that these configuration items are a subset of the configuration items that were present in the configuration page.
- WLAN managers can configure directly from this page without having to go back to the WLAN setup page.

3.3.2 Configuring WLAN CLB parameters from the table:

• Selecting any row in the event table and clicking the "gear" icon on the top right corner of the event table pops up the following box.



Figure 10

• This is the same configuration items as in the main WLAN Client Load Balancing configuration.

3.3.3 Verifying That CLB Works

The stats-GUI was created specifically to quickly tell whether or not CLB is working. We shall see how below.

3.3.3.1 To verify that AP Load Balancing works using the GUI:

- 1. Check the Neighbor load graph, and confirm that the composite load for each neighbor is roughly the same within the margin specified in configuration.
- 2. Move the slider back in time and confirm that this is true for all recorded time.
- 3. As you move the slider back in time, each time a neighbor's load goes above the average, check the events table to see if any clients are being associated. They should all be denied. This further proves that the loads are deliberately being balanced by the AP, and that this is not a fluke.



3.3.3.2 To verify that Band Balancing works as designed:

- 1. Check the relative ratio of the 5 GHz band Load versus the 2.4GHz band load at any point in the Load Balancing Graph over 60 minutes. It should roughly equal the configured band ratio.
- 2. To confirm that this is deliberately being done, move the slider to multiple points in the past, and see the corresponding events in the table and the state of the circuit switch comparisons. You should see one or the other radio being turned off as a result of overload on the band.

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3.3.3.3 To verify that Channel Balancing works as designed:

- 1. Check the 2.4GHz and 5 GHz Channel Load graphs.
- 2. The composite load on each channel should be roughly the same within each band.
- 3. Further, ensure that this was true by moving the slider back in time.
- 4. Finally, ensure that this was a deliberate outcome by checking the circuit and the events at that each time.

3.4 Configuration Use Case's

- Auditorium use case: client load balancing with emphasis based on AP load.
 In such a scenario we have large number of clients and load should be based on number of clients and not throughput
- 2) Classroom Use case: client load balancing with emphasis on throughput and load per channel.

In a classroom students could be watching education videos; throughput is a major concern

 Mix environment use case: client load balancing with emphasis on using 5ghz band Used for better performance and less RF interference.

3.5 Auditorium Use Case

Scenario:

Exhibition hall; with approx 100-200 Wi-Fi users surfing internet and downloading email and surfing the web. The Wi-Fi users have mixed wireless nics that are capable of using 2.4 GHz and or 2.4 Ghz/5Ghz bands. The 5 GHz band has more none overlapping channels and allows for better bandwidth so we would like to put more clients on that band.

1. The below configuration sets the band ratio to be 1:3, for every 1% load on 2.4ghz, there should be 3% load on 5ghz.

2. Configure the following on all APs:

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing balance-band-loads ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing band-ratio 2.4ghz 1 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing band-ratio 5ghz 3 ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-ap-loads ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-channel-loads 2.4ahz ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-channel-loads 5qhz ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 2.4ghz-load client-weightage 100 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 2.4ghz-load throughputweightage 0 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 5ghz-load client-weightage 100 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 5ghz-load throughputweightage 0 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing equality-margin band 0 ap7131-DC7EA6(config-profile-default-ap7131)#com ap7131-DC7EA6(config-profile-default-ap7131)#

GUI Setup in the Default Profile for the AP

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	General	Client Load Balancing				
	Adoption	Balance AP Loads	\checkmark			
	▼ Interface	Min. Value to Trigger Balancing	5 (0 to 100 percent)			
	Ethernet Ports	Balance Band Loads by Ratio	\checkmark			
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	► Network	Band Ratio (SGHz)	/ 3 (0 to 10)			
	► Security	Balance 2.40Hz Channel Loads	/			
	Services	Min. Value to Trigger 2.4GHz Channel Balancing	5 (0 to 100 percent)			
	► Management	Balance 50Hz Channel Loads	/			
	w Advanced	Min. Value to Trigger SGHz Channel Balancing	5 (0 to 100 percent)			
	Client Load Balancing	AP Load Calculation				
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		Weightage given to Client Count	/ 100 (0 to 100 percent)			
		Comparing Loads				
		Max. AP Load Difference Considered Equal	1 (0 to 100 percent)			
		Max. Band Load Difference Considered Equal	1 (0 to 100 percent)			
		Max. 2.4GHz Load Difference Considered Equal	1 (0 to 100 percent)			
		Max: SGHz Load Difference Considered Esual	1 (0 to 100 percent)			
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Figure 11

3.6 Classroom Use Case

Scenario:

A school system is in the process of implementing a new IVideo Learning application and the existing laptops have only 2.4 (BG Wireless Cards). We want to balance the loads across all channels to give them the best bandwidth and channel utilization.

The below configuration enables channel load balancing on the 2.4 GHz band.

1. Configure the following on all APs using the default AP profile:

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing balance-channel-loads 2.4ghz ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-channel-loads 5ghz ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-band-loads ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-ap-loads ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing 2.4ghz-load client-weightage 100

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 2.4ghz-load throughputweightage 0

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing equality-margin 2.4ghz 0 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing hiwater-threshold 2.4ghz-load 0 ap7131-DC7EA6(config-profile-default-ap7131)#com

ap7131-DC7EA6(config-profile-default-ap7131)#exit

GUI Setup in the Default Profile for the AP

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Figure 12

3.7 Noisy 2.4 Ghz Environment Use Case

Scenario:

Exhibition hall; with approx 100-200 Wi-Fi users surfing internet and downloading email and surfing the web. The Wi-Fi users have mixed wireless nics that are capable of using 2.4 GHz and or 2.4 GHz/5Ghz bands. Everyone is using BlueTooth and there are 2.4 GHz Cameras broadcasting in the area. The 5 GHz band has more none overlapping channels and less interference so we would like to put more clients on that band.

- 1. The below configuration sets the band ratio to be 1:3, for every 1% load on 2.4ghz, there should be 3% load on 5ghz.
- 2. Configure the following on all APs:

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing balance-band-loads ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing band-ratio 2.4ghz 1 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing band-ratio 5ghz 3 ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-ap-loads ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-channel-loads 2.4ghz

ap7131-DC7EA6(config-profile-default-ap7131)#no load-balancing balance-channel-loads 5ghz

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 2.4ghz-load client-weightage 100

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 2.4ghz-load throughputweightage 0

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 5ghz-load client-weightage 100 ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing 5ghz-load throughput-weightage 0

ap7131-DC7EA6(config-profile-default-ap7131)#load-balancing equality-margin band 0 ap7131-DC7EA6(config-profile-default-ap7131)#com ap7131-DC7EA6(config-profile-default-ap7131)#

GUI Setup in the Default Profile for the AP

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4. RF Switch Running Configuration:

The following shows the running configuration of the RFS7000 switch used to create this guide:

```
RFS4000# show running-config
  Configuration of RFS4000 version 5.1.0.0-074R
version 2.1
ip access-list BROADCAST-MULTICAST-CONTROL
 permit tcp any eq 67 any eq dhcpc rule-precedence 11
deny udp any range 137 138 any range 137 138 rule-precedence 20
deny ip any 224.0.0.0/4 rule-precedence 21
deny ip any host 255.255.255 rule-precedence 22
 permit ip any any rule-precedence 100
ip access-list dhcp
mac access-list PERMIT-ARP-AND-IPv4
 permit any any type ip rule-precedence 10
permit any any type arp rule-precedence 20
firewall-policy default
 no ip dos tcp-sequence-past-window
role-policy test
igmp-snoop-policy default
 no igmp-snooping
 no querier
 unknown-multicast-fwd
I
I
mint-policy global-default
wlan-qos-policy default
qos trust dscp
 qos trust wmm
radio-qos-policy default
aaa-policy MD-AAA-Policy
authentication server 1 onboard controller
captive-portal MD-Captive
server host 192.168.2.100
server mode centralized
 terms-agreement
 webpage internal agreement main-logo www.motorola.com
 use aaa-policy MD-AAA-Policy
wlan MD-RSF4000
ssid MD-RSF4000
 vlan 1
 bridging-mode local
 encryption-type ccmp
 authentication-type none
 wpa-wpa2 psk 0 george01
 client-load-balancing
wlan cp
 description captive porta
 ssid cp
vlan 1
 bridging-mode tunnel
encryption-type none
 authentication-type none
use captive-portal MD-Captive
 captive-portal-enforcement
smart-rf-policy MD-Smart-RF
 auto-assign-sensor
```

```
channel-list 5GHz 36,40,44,48,52,56,136,140,149,153,157,161,165
device-categorization inocent\ neighbior
 mark-device neighboring client any
I
wips-policy md-wips
auto-provisioning-policy petes\ config
adopt ap650 1 default-ap650 bld3 any
radius-group Engineers
 guest
 policy vlan 1
1
radius-group Lab-Admin
 policy vlan 1
policy day mo
 policy day tu
policy day we
 policy day th
 policy day fr
policy day sa
policy day su
radius-user-pool-policy LAB-Pool
user pete password 0 12345678 group Lab-Admin
 user mike password 0 hume
radius-server-policy MD-TME-Radius-Policy
use_radius-user-pool-policy LAB-Pool
 no ldap-group-verification
dhcp-server-policy MDLAB
dhcp-pool LabPool
  network 192.168.2.0/24
  address range 192.168.2.200 192.168.2.240
default-router 192.168.2.100
I
management-policy default
 no http server
 https server
 ssh
 user admin password 1 196dab753782380ca3e8b5baaea455ceda5b89d8b25490e7d1b287673a35568c role
superuser access all
 user operator password 1 652cf90b270df3c233ef0b2efbf35ff535228c3917c07e8cda2811a943ef5ed1 role
monitor access all
 no snmp-server manager v2
 snmp-server community public ro
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snmp-server user snmptrap v3 encrypted des auth md5 0 motorola
snmp-server user snmpmanager v3 encrypted des auth md5 0 motorola
I
profile rfs4000 default-rfs4000
 autoinstall configuration autoinstall firmware
 use radius-server-policy MD-TME-Radius-Policy
 crypto isakmp policy default
crypto ipsec transform-set default esp-aes-256 esp-sha-hmac
 interface radio1
 interface radio2
 interface up1
  ip dhcp trust
  qos trust dscp
  qos trust 802.1p
 interface gel
  ip dhcp trust
  qos trust dscp
qos trust 802.1p
 interface ge2
  ip dhcp trust
  qos trust dscp
qos trust 802.1p
 interface ge3
  ip dhcp trust
  qos trust dscp
qos trust 802.1p
 interface ge4
  ip dhcp trust
  qos trust dscp
```

qos trust 802.1p interface ge5 ip dhcp trust qos trust dscp qos trust 802.1p interface wwan1 use firewall-policy default logging on service pm sys-restart profile ap71xx default-ap71xx autoinstall configuration autoinstall firmware interface radio1 data-rates gn wlan MD-RSF4000 bss 1 primary wlan cp bss 2 primary preamble-short interface radio2 shutdown data-rates an interface radio3 interface ge1 ip dhcp trust qos trust dscp qos trust 802.1p interface ge2 ip dhcp trust qos trust dscp qos trust 802.1p interface vlan1 ip address dhcp ip dhcp client request options all interface wwan1 use captive-portal server MD-Captive logging on service pm sys-restart profile ap6532 default-ap6532 autoinstall configuration autoinstall firmware interface radio1 interface radio2 interface gel ip dhcp trust qos trust dscp qos trust 802.1p interface vlan1 ip address dhcp ip dhcp client request options all
use firewall-policy default logging on service pm sys-restart I profile ap650 default-ap650 autoinstall configuration autoinstall firmware interface radio1 interface radio2 interface ge1 ip dhcp trust qos trust dscp qos trust 802.1p interface vlan1 ip address dhcp ip dhcp client_request options all use firewall-policy default logging on service pm sys-restart profile ap6511 default-ap6511 autoinstall configuration autoinstall firmware interface radio1 interface up1 ip dhcp trust qos trust dscp qos trust 802.1p interface fel

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end

5. Reference Documentation:

Description	Location
Motorola RFS Series Wireless LAN Switches WiNG System Reference Guide	http://support.symbol.com
Motorola RF Switch CLI Reference Guide	http://support.symbol.com

