



RF based Automatic AP Load Balancing

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Information about RF based Automatic AP Load Balancing

The RF based Automatic AP Load Balancing feature improves upon the existing Site Tag-Based Load Balancing feature, where the APs are load balanced by assigning them to wireless network control daemons (WNCd) based on site tags. If the APs in a named site tag are beyond the capacity of a WNCd, it may lead to uneven distribution of APs across the WNCd instances, resulting in high memory and CPU issues. Though the number of APs in a site tag can be limited to 1000 by using the **load** command, it may still lead to uneven distribution of APs if the AP load limit is not correctly configured. In some instances, all the APs belonging to a site tag may not be colocated as well.

The RF based Automatic AP Load Balancing feature uses Radio Resource Management (RRM) neighbor report-based AP grouping and load-balancing across WNCd instances.

When this feature is enabled, it forms AP clusters based on the RSSI received from AP neighbor reports. These clusters or neighborhoods are further split into sub-neighborhoods and smaller areas. The resulting groups of APs are then distributed evenly across the WNCd processes. The AP load balancing takes effect only after a controller reboot or through an AP CAPWAP reset triggered by the **ap neighborhood load-balance apply** command. When the RF based Automatic AP Load Balancing feature is active, it overrides other site tag-based load balancing.

Supported Platforms

- Cisco Catalyst 9800-80 Wireless Controller
- Cisco Catalyst 9800-40 Wireless Controller
- Cisco Catalyst 9800 Wireless Controller for Cloud
- Catalyst 9800 Embedded Wireless Controller for a Cisco switch

Prerequisites for RF based Automatic AP Load Balancing

Ensure that you run the feature on a stable network, where the APs are fully deployed and are given enough time to discover all the RF neighbors.

Restrictions for RF based Automatic AP Load Balancing

- You cannot use the same calendar profile for AP neighborhood policy or AP profile.
- This feature is supported only on APs in local and flex mode.
- You cannot run the feature when the overall load on the system is high.
- You cannot use the output of the **show wireless loadbalance tag affinity** command when the RF based Automatic AP Load Balancing feature is enabled.

Use Cases for RF based Automatic AP Load Balancing

1. This feature allows using a single site tag for all the deployed APs.
2. This feature provides better load balancing of the APs across WNCd instances when more number of APs are attached to a named-site tag than the available capacity of the WNCds in the controller.
3. This feature is suitable for large number of client intra-WNCd roaming scenarios. For example, if a controller is configured in a campus to manage APs of two separate buildings, then all the APs of that building are assigned to a single WNCd rather than allocating them to separate WNCds.

Guidelines for RF based Automatic AP Load Balancing

- For a new deployment, use the site tags and follow the current site tag recommendations to evenly distribute the APs, or use the **site tag load** command to automatically distribute the APs. Using site tags, you can ensure that all the APs of the same site tag goes to the same WNCd, which helps in troubleshooting and intra-WNCd roaming.
- If you are unable to use a site tag because you cannot group APs, or do not want to spend time designing site tags, use the default site tag or any named site tag and turn on the RF based Automatic AP Load Balancing feature.
- In an existing deployment, if you have high CPU issues because of an unbalanced system, use the auto RRM load balance system instead of redesigning the site tags.
- In an existing deployment, if you do not have any CPU load issues despite having an unbalanced system, do not change anything.

Configuring RF based Automatic AP Load Balancing

Before you begin

There are two phases of the RF based load-balancing algorithm enablement:

1. Running the algorithm: The RF based Automatic AP Load Balancing feature run can be scheduled based on calendar profile start time expiry using **ap neighborhood calendar-profile** command, or on-demand

start of the algorithm using the **ap neighborhood load-balance start** command. Calendar profile start timer can be scheduled daily, weekly, or monthly.

- Applying the algorithm: The RF based Automatic AP Load Balancing feature can be applied by controller reload or by using the **ap neighborhood load-balance apply** command when the **wireless load-balance ap method rf** configuration is enabled.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 2	ap neighborhood calendar-profile <i>calendar-profile</i> Example: Device(config)# ap neighborhood calendar-profile ap-calendar-profile	Configures an AP neighborhood calendar profile. Note After the calendar profile is set, it is optional to run Step 4 . However, if you want to immediately perform a load balance, run Step 4 .
Step 3	exit Example: Device(config)# exit	Returns to privileged EXEC mode.
Step 4	ap neighborhood load-balance start Example: Device# ap neighborhood load-balance start	(Optional) Starts AP neighborhood load-balance algorithm calculation and WNCd allocation.
Step 5	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 6	wireless load-balance ap method rf Example: Device(config)# wireless load-balance ap method rf	Configures RF-based AP load balancing.
Step 7	exit Example: Device(config)# exit	Returns to privileged EXEC mode.
Step 8	ap neighborhood load-balance apply Example:	Runs on-demand RRM-based AP load balancing.

	Command or Action	Purpose
	<pre>Device# ap neighborhood load balance apply</pre>	This command rebalances the APs using CAPWAP reset. If an AP is already in the correct WNCd instance, then it will not be CAPWAP reset. This command cannot be executed if the RRM-based AP load balancing algorithm is running, or algorithm results are not available.

Disabling RF based Automatic AP Load Balancing

Before you begin

RF based Automatic AP Load Balancing feature is disabled by default. The APs may remain load balanced based on algorithm data even after disabling all the feature configurations and clearing all the algorithm outputs. To rebalance all the APs based on the default method of site tags, reload the controller or perform a CAPWAP reset on all the APs.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 2	no wireless load-balance ap method rf Example: <pre>Device(config)# no wireless load-balance ap method rf</pre>	Disables RF-based AP load balancing.
Step 3	no ap neighborhood calendar-profile calendar-profile Example: <pre>Device(config)# ap neighborhood calendar-profile ap-calendar-profile</pre>	Disables the AP neighborhood calendar profile.
Step 4	exit Example: <pre>Device(config)# exit</pre>	Returns to privileged EXEC mode.
Step 5	ap neighborhood load-balance clear Example: <pre>Device# ap neighborhood load-balance clear</pre>	Clears the AP neighborhood load-balance algorithm calculation and resource allocation.

Verifying Automatic WNCd Load Balancing

To verify the results of the RF-based algorithm and the result of the related load balancing, use the following **show** commands.

To view the AP neighborhood summary, use the following **show** command:

```
Device# show ap neighborhood summary
```

NH-ID = Neighborhood ID

AREA-ID = Area ID of neighborhood

Total number of neighborhood: 5

Total number of algorithm iterations: 1

Ideal AP capacity per WNCd instance: 210

Total number of neighborhood area: 14

NH-ID	AREA-ID	Process Name	Number of APs
0	0x00000000	WNCd_1	1
1	0x00000000	WNCd_0	2
2	0x00000000	WNCd_0	100
2	0x00000001	WNCd_0	100
2	0x00000002	WNCd_3	100
2	0x00000003	WNCd_4	50
3	0x00000000	WNCd_1	100
3	0x00000001	WNCd_1	100
3	0x00000002	WNCd_4	100
3	0x00000003	WNCd_4	50
4	0x00000000	WNCd_2	100
4	0x00000001	WNCd_2	100
4	0x00000002	WNCd_3	100
4	0x00000003	WNCd_3	50

To view the AP neighborhood details, use the following **show** command:

```
Device# show ap neighborhood details
```

NH-ID = Neighborhood ID

AREA-ID = Area ID of neighborhood

Number of APs: 4

NH-ID	AREA-ID	WNCd instance	AP Name	Ethernet MAC
0	0x00000000	1	EDU_BR_01_00_28_3702	bc16.6509.bfcc
1	0x00000000	0	ci-glad-mdns-ap	0cd0.f894.567c
1	0x00000000	0	EDU_VW_9120_1_2	c4f7.d54c.f978
2	0x00000000	0	ewlc-hc-tsim-30-1	00b9.3000.02f0

To view the AP neighborhood information, use the following **show** command:

```
Device# show ap neighborhood 0 details
```

NH-ID = Neighborhood ID

AREA-ID = Area ID of neighborhood

Number of APs: 1

NH-ID	AREA-ID	WNCd instance	AP Name	Ethernet MAC
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```
0          0x00000000      0          APA023.9FD8.EA22      a023.9fd8.ea22
```

To view the AP neighborhood details using its MAC address, use the following **show** command:

```
Device# show ap neighborhood mac 0aa8.89f0.0001 details
```

```
NH-ID = Neighborhood ID
AREA-ID = Area ID of neighborhood
```

AP Name	Ethernet MAC	Radio MAC	NH-ID	AREA-ID	WNCd instance
AP6B8B4567-0001	0aa8.89f0.0001	0aa8.8900.0100	0	0x00000000	0

To view the WNCd information, use the following **show** command:

```
Device# show ap neighborhood wncd 0 details
```

```
NH-ID = Neighborhood ID
AREA-ID = Area ID of neighborhood
```

```
Number of APs: 9
```

WNCd instance	NH-ID	AREA-ID	AP Name	Ethernet MAC
0	2	0x00000000	9130I-1	0c75.bdb5.ffc0
0	2	0x00000000	9130E-2	3c41.0efe.46f0
0	2	0x00000000	9120E-2	5ce1.7628.8bbc
0	2	0x00000000	9130I-2	e44e.2d2e.59d4
0	2	0x00000000	9120E-1	5ce1.7628.aa0c
0	2	0x00000000	9120E-3	5ce1.7628.af04
0	2	0x00000000	3700I-2	b838.6159.dfa4
1	0	0x00000000	3800I-2	6cb2.ae2e.dfdc
2	1	0x00000000	4800-1	f4db.e643.fa72

```
NH-ID = Neighborhood ID
AREA-ID = Area ID of neighborhood
Number of APs: 5
```

WNCd instance	NH-ID	AREA-ID	AP Name	Ethernet MAC
0	12	0x00000000	AP6B8B4567-0001	0aa8.89f0.0001
0	12	0x00000000	AP6B8B4567-0004	0aa8.89f0.0004
0	12	0x00000000	AP6B8B4567-0007	0aa8.89f0.0007
0	12	0x00000000	AP6B8B4567-0010	0aa8.89f0.000a
0	12	0x00000000	AP6B8B4567-0013	0aa8.89f0.000d